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ABSTRACT

This publication encompasses questions for Ceramics, Graphic Arts, Metals, and Plastics for the second of a series. The use of this publication and the previously published (1973) book containing resource items for Drawing, Electricity/Electronics, Power Mechanics, and Woods (ED 109 457) will provide complete coverage of the basic series courses as outlined in "A Handbook for Administrators" (1970). These two publications are designed to assist in the improvement of classroom tests at the secondary level. It is recommended that teachers select and use those questions which have relevance to their instructional practices as the publications are a resource rather than a complete examination. Answer keys are provided. (Author/RC)

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INDUSTRIAL ARTS

TEST DEVELOPMENT

BOOK II

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RESOURCE ITEMS FOR

- * CERAMICS
- * GRAPHIC ARTS
- * METALS
- * PLASTICS

TM004 918

THE UNIVERSITY OF THE STATE OF NEW YORK / THE STATE EDUCATION DEPARTMENT
BUREAU OF INDUSTRIAL ARTS EDUCATION
BUREAU OF ELEMENTARY AND SECONDARY EDUCATIONAL TESTING, ALBANY, NEW YORK 12234
1975

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FOREWORD

This publication, Industrial Arts - Test Development - Book 2, encompasses questions for Ceramics, Graphic Arts, Metals and Plastics for the second of a series. The use of this publication and the previously published (1973) book containing resource items for Drawing, Electricity/Electronics, Power Mechanics and Woods will provide complete coverage of the Basic Series courses as outlined in A Handbook for Administrators (1970).

These two publications are designed to assist in the improvement of classroom tests at the secondary level. It is recommended that teachers select and use those questions which have relevance to their instructional practices as the publications are a resource rather than a complete examination.

This publication was developed jointly by the Bureau of Elementary and Secondary Educational Testing and the Bureau of Industrial Arts. Mr. Kenneth Ormiston, Testing, and Mr. Jarvis Baillargeon, Industrial Arts, coordinated the publication. Industrial arts teachers who served as item writers were: Eric Amundsen, Newfield; Thomas Brannick, Kingston; Donald Horan, Auburn; Herbert Insley, Colonie; Donald Jambro, Greece; William Liscavage, Kenmore; William Rogowski, West Seneca; William Rosettie, Elmira; Richard Starkey, Liverpool.

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CERAMICS

Directions (1-185): On your answer paper write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Ceramic Products

Unit A Enamels (1-9)

1 Vitreous enamels should be fused to base metals at temperatures between

(1) 850° - 1050° F
(2) 1100° - 1300° F
(3) 1350° - 1550° F
(4) 1600° - 1800° F

2 An important factor to consider when enameling is the

1 thickness of the metal shape
2 thickness of the applied enamel
3 shape of the metal object
4 cleanliness of the metal surface

3 Enameling processes are often classified according to the

1 type of metal being used
2 type of firing operation performed
3 color of enamel being used
4 type of enamel being used

4 The process of dipping a base metal into an acid solution to clean the oxides and other impurities from the metal is known as

1 sizing
2 dunting
3 deflocculating
4 pickling

5 A glassy inorganic coating that is bonded to a glass or ceramic surface by fusion is known as a

1 porcelain enamel
2 vitreous enamel
3 transparent enamel
4 translucent enamel

6 A glassy inorganic coating that is bonded to a metal surface by fusion is known as a

1 porcelain enamel
2 vitreous enamel
3 transparent enamel
4 translucent enamel

7 Why is a prepared gum solution applied to an object before it is enameled?

1 to form a sticky surface to hold the enamel
2 to prevent oxidation from taking place
3 to allow the designs to be formed with the enamel
4 to clean the object before enameling

8 When applying enamel to a metal shape, the thickness of the powder should be

(1) 1/4 the thickness of the metal
(2) 1/2 the thickness of the metal
(3) 3/4 the thickness of the metal
(4) the same thickness as the metal

9 Which country is noted for its tin-enameled earthenware?

1 England
2 Holland
3 Italy
4 France

Unit B Glass (10-20)

10 Which type of glass is used to manufacture fine crystal?

1 lead glass
2 soda lime glass
3 silica glass
4 cellular glass

11 The industrial glass process most commonly used for producing plate glass is_

1 extruding
2 spinning
3 drawing
4 rolling

12 The major ingredient in any type of glass is

1 talc
2 silica
3 limestone
4 kaolin

13 In approximately what year did glass making become an established industry in the United States?

(1) 1600
(2) 1650
(3) 1700
(4) 1750

14 The Corning Glass Works in Corning, New York was established in

(1) 1569
(2) 1669
(3) 1769
(4) 1869

15 A glass bottle will begin to sag at a temperature of approximately

(1) 500° F (260° C)
(2) 1000° F (540° C)
(3) 1500° F (815° C)
(4) 2000° F (1095° C)

16 In which process is glass softened by heating to relieve strain?

1 sealing	3 treating
2 polarizing	4 annealing

17 When creating a sagged glass pattern, the design is first carved into

1 bisque ware	3 stoneware
2 fire brick	4 grog ware

18 Bent glass molds are made of

1 metal	3 glass
2 wood	4 clay

19 The best drill for glass is a

1 prismatic drill	3 three-corner drill
2 spear-point drill	4 four-corner drill

20 A table used for cutting glass should be covered with

1 metal	3 carpet
2 wood	4 asbestos

Unit C Plaster (21-27)

21 A mold used to produce other molds is called a

1 parent mold
2 plaster mold
3 wood mold
4 case mold

22 Which one of the following materials contains hydrated calcium sulfate and is used to make molds?

1 gypsum
2 grog
3 frit
4 flux

23 If warm water is used to mix plaster, the plaster will

1 set up slower than normal
2 set up faster than normal
3 be too brittle after it sets up
4 be soft and spongy after it sets up

24 Plaster is divided into many different grades which are classified according to the

1 porosity of the cured plaster
2 hardness of the cured plaster
3 absorption rate of the cured plaster
4 color of the cured plaster

25 Gypsum that is found in a highly compressed state and is suitable for producing gem stones is called

1 pearl
2 alabaster
3 turquoise
4 granite

26 The commercial name for ground-up gypsum is

(1) U.S. Potters Plaster No. 1
(2) Spackle
(3) Plaster of Paris
(4) Portland Plaster

27 The normal time period required for U.S. Potters Plaster No. 1 to set up is

(1) 5 minutes
(2) 10 minutes
(3) 20 minutes
(4) 40 minutes

Unit D Whitewares (28-47)

28 When making china, the Spanish used a tub oxide glaze to conceal the dark-colored clay of the body. This glaze was known as

1 upchurch
2 majolica
3 raku
4 salt glaze

29 Vases, deep bowls, cups, and pitchers are examples of

1 hollow ware
2 stoneware
3 whiteware
4 flatware

30 Which type of china contains calcium phosphate and is similar to porcelain?

1 Belgian china
2 English china
3 Syracuse china
4 Wedgewood china

31 Unglazed fired ware is called

1 greenware
2 bisqueware
3 chinaware
4 flatware

32 French ceramic makers of the 18th century created a soft porcelain with a glass glaze. This ware was known as

1 Doulton ware
2 Dresden ware
3 Delftware
4 Sèvres ware

33 Who was the creator of Dresden china?

1 Johann Friedrich Bottger
2 Bernard Palissy
3 Richard Champion
4 Helene de Hangest

34 English bone china is 40 percent

1 lime deposit
2 calcined bone
3 feldspar
4 quartz

35 Which type of stoneware is unglazed, dense, and opaque?

1 porcelain
2 jasper
3 whiteware
4 terra-cotta

36 Plates, saucers, platters, round and oval dishes and trays are a type of ware called

1 hollow ware
2 stoneware
3 whiteware
4 flatware

37 A mixture of clay and water that has the consistency of heavy cream is called

1 glaze
2 sizing
3 slip
4 body

38 The largest amount of shrinkage occurs in clay during the change from

1 liquid to plastic
2 plastic to leather-hard
3 leather-hard to bone-dry
4 bone-dry to bisque

39 In ceramics, warping is usually caused by

1 nonuniform drying
2 improper fettling
3 too rapid cooling after firing
4 excess water in the clay

40 The most common industrial method used to produce hollow ware objects is

1 jiggering
2 pressing
3 jolleying
4 extruding

41 The most common industrial method used to produce flat-ware objects is

1 jiggering
2 pressing
3 jolleying
4 extruding

42 Which method is most commonly used during mass production to glaze small pieces?

1 spraying
2 dipping
3 brushing
4 pouring

43 What is the main reason why clay objects explode when they are fired?

1 Air bubbles are trapped in the clay.
2 The glaze is too thick.
3 The clay is too thick.
4 The firing temperature is too high.

44 Which prehistoric invention greatly influenced whole ways of life and created a revolution in pottery making?

1 casting mold
2 fire brick
3 continuous kiln
4 potter's wheel

45 The rate of change in the length of an object per degree change in temperature is a measure of an object's

1 coefficient of expansion
2 absorption rate
3 drying time
4 shrinkage

46 The process of dispersing a clay suspension so that it has little tendency to settle, a low viscosity, and a low water content is called

1 de-airing
2 blunging
3 deflocculating
4 dunting

47 A mixture of clays and nonplastics that is workable and has suitable firing properties is called a

1 body
2 cone
3 glaze
4 greenware

Unit E Glazes (48-65)

48 In a kiln, the glazed ware is placed on a

1 cone
2 post
3 shelf
4 stilt

49 Crawling in a glaze is usually caused by too

1 damp air
2 dry air
3 much dust
4 high a firing temperature

50 A paper stencil used to keep certain parts of a ware from being glazed is a

1 frisket
2 encaustic
3 sgraffito
4 trailer

51 The ingredient in a glaze which causes the glaze to melt at a given temperature is the

1 colorant
2 alkaline
3 enamel
4 flux

52 Which method is used to apply a glaze inside bottles or on irregularly shaped wares?

1 brush method
2 pour method
3 spray method
4 dip method

53 Blisters are more likely to form in a glaze which contains too much

1 manganese dioxide
2 potassium oxide
3 calcium dioxide
4 tin oxide

54 The oldest type of glaze is the

1 ash glaze
2 frit glaze
3 crackle glaze
4 mat glaze

55 To what type of glaze is zinc oxide added?

1 crystalline glaze
2 bristol glaze
3 mat glaze
4 crackle glaze

56 What type of glaze is put on wares that contain a high proportion of grog?

1 raku glaze
2 slip glaze
3 salt glaze
4 crystalline glaze

57 What type of glaze is made from raw material clays?

1 salt glaze
2 crystalline glaze
3 luster glaze
4 slip glaze

58 What gas is produced in a kiln during the salt glaze procedure?

1 hydrogen
2 chlorine
3 oxygen
4 fluorine

59 A flux commonly used in high-fired glazes is

1 red lead
2 lead carbonate
3 calcium carbonate
4 bicarbonate of soda

60 When an alkaline flux is added to a glaze, the glaze will have a

1 turquoise-blue color
2 red-orange color
3 yellow-orange color
4 green-blue color

61 The two fluxes most commonly used in low-fired glazes are

1 lead and calcium compounds
2 alkaline and calcium compounds
3 lead and alkaline compounds
4 alkaline and silica compounds

62 The three essential ingredients of a glaze are

1 silica, lead, and alumina
2 silica, feldspar, and alumina
3 alumina, kaolinite, and lead
4 alumina, borax, and lead

63 A flux is added to a glaze to

1 raise the melting point of the glaze
2 lower the melting point of the glaze
3 enhance the color of the glaze
4 change the surface structure of the glaze

64 The development of fine cracks in a glaze after cooling is called

1 sintering
2 pinholing
3 crazing
4 crawling

65 What type of finish is produced by intentionally crazing a glaze in a network pattern?

1 crawling finish	3 combed ware finish
2 crackle finish	4 vitreous finish

Unit F Electrical (66-71)

66 Which one of the following is a ceramic material that is a semiconductor at room temperature and a conductor at higher temperatures?

1 zirconia	3 alumina
2 copper	4 sodium silicate

67 Which one of the following is a ceramic material that is used in electronic equipment such as television sets, magnetic switches and wide-band transformers?

1 zircon	3 cordierite
2 ferrite	4 steatite

68 Which material is used as an insulater in most spark plugs?

1 silica	3 porcelain
2 glass	4 kaolin

69 Which type of wire is used in wire wound electric kilns?

1 nichrome wire	3 nickel plated wire
2 nitrate wire	4 bronzite wire

70 Ceramic conducting materials are used in the manufacture of

1 thermometers	3 pyrometers
2 pyrometric cones	4 thermistors

71 Which electrical device is used in many kilns to measure firing temperatures?

1 thermometer
2 thermostat
3 pyrometer
4 pyrometric cone meter

Unit G Material Science (72-91)

72 The ability of a material to be bent or strectched without cracking is known as

1 porosity
2 vitrification
3 durability
4 plasticity

73 The weight per unit volume is a measure of an object's

1 absorption rate
2 shrinkage
3 coefficient of expansion
4 density

74 A crushed hard-fired clay that is used in terra-cotta and refractory bodies to reduce shrinkage is

1 frit
2 flux
3 gypsum
4 grog

75 The process of making lightly scored cuts in the edges of a clay slab before applying slip and joining the edges is known as

1 wedging
2 burnishing
3 welding
4 footing

76 A body ingredient that softens or melts during firing and cements the other materials together is

1 frit
2 grog
3 flux
4 frisket

77 The nonclay materials such as mica, feldspar, and quartz in a clay are known as

1 bodies
2 grog
3 crystal glazes
4 accessory minerals

78 When casting slip, which ingredient is used to reduce the amount of water and maintain a better suspension?

1 flux
2 frit
3 deflocculant
4 grog

79 The approximate rate of shrinkage from wet clay to glazed ware is

(1) 5% to 10%
(2) 10% to 15%
(3) 15% to 20%
(4) 20% to 25%

80 Compared to residual clays, sedimentary clays usually

1 are more colorful
2 are less plastic
3 contain smaller particles
4 are found closer to the parent rock

81 What are the two basic categories into which all clays can be grouped?

1 sedimentary and metamorphic
2 igneous and residual
3 metamorphic and igneous
4 residual and sedimentary

82 Compared to other types of clays, brick clays contain a larger amount of

1 lead
2 copper
3 iron
4 bronze

83 When the physical water is removed from clay, the remaining material is called

1 bone dry
2 bisque
3 leather-hard
4 plastic

84 Which material has a high fusion point and is used to make kilns and kiln furniture?

1 bisque
2 body
3 whiteware
4 refractory

85 Which two physical properties must the clay used for brick making have?

1 plasticity and density
2 viscosity and rigidity
3 plasticity and rigidity
4 firing ability and plasticity

86 The ability of an object to transmit scattered light is known as

1 translucency
2 opacity
3 transparency
4 vitrification

87 Dry clay materials are ground in a

1 mortar
2 ball mill
3 pug mill
4 dry press

88 Which type of kiln is usually used in the high speed commercial production of ceramics?

1 box kiln
2 rotary kiln
3 beehive kiln
4 tunnel kiln

89 The physical and chemical water have been removed from a clay object. If the clay object has not been glazed, it is called

1 bone dry	3 leather-hard
2 bisque	4 plastic

90 Glazed fired clay is called

1 bisque ware	3 dull ware
2 glost ware	4 earthenware

91 The most common heating element used in the electric kiln is made of

1 nickel nichrome	3 kanthal
2 copper nichrome	4 kanthal super

Unit H Industry and Careers (92-100)

92 Some of the highest paid skilled workers in the ceramics field are

1 jiggers	3 glassblowers
2 machine tenders	4 casters

93 Which person would normally take samples of work being produced and test them in a laboratory?

1 tender	3 engineer
2 maintenance person	4 technician

94 Environmental technicians would not usually be involved in

1 water processing	3 production time studies
2 particle precipitation	4 waste disposal

95 In the ceramics industry, the job of the liners and the gilders is to

1 make the glaze
2 finish the cups
3 fire the kiln
4 decorate the ware

96 In the ceramics industry, the person who assists the jiggerman is the

1 caster
2 turner
3 batter-out
4 sponger

97 The art and science of forming objects from earthy materials with the aid of heat is called

1 mass production
2 manufacturing
3 pottery making
4 ceramics

98 In the whiteware industry, a skilled plaster worker is called a

1 mold maker
2 handle worker
3 sponger
4 caster

99 Which career in the field of industrial ceramics requires a good background and interest in three-dimensional and graphic design, industrial processes and problems, problems of function and the physical structure, and actions of materials?

1 ceramic engineer
2 ceramic designer
3 ceramic gilder
4 ceramic jiggerman

100 Which career in the field of industrial ceramics would require a good background and interest in mathematics, chemistry, physics, mechanics and strength of materials?

1 ceramic engineer
2 ceramic designer
3 ceramic gilder
4 ceramic jiggerman

Part II Structural Ceramics

Unit A Cements (101 - 109)

101 The traditional unit for measuring cement is

1 pounds
2 boxes
3 bags
4 barrels

102 A barrel of cement weighs

(1) 80 kilograms (176 lb)
(2) 125 kilograms (276 lb)
(3) 170 kilograms (376 lb)
(4) 216 kilograms (476 lb)

103 The first step in the process of manufacturing cement is

1 burning
2 clinkering
3 ball milling
4 quarrying

104 Portland cement was first made by

1 the Romans
2 Joseph Aspdin
3 the Greeks
4 Eero Saarinen

105 The major ingredient of Portland cement is

1 alumina
2 silica
3 limestone
4 shale

106 Portland cement was named after a

1 rock formation
2 city
3 man
4 street

107 What are ball mills?

1 kilns
2 factories
3 rotating cylinders
4 huge crushers

108 Adding gravel or crushed stone to a mixture of sand, cement and water produces

1 masonite
2 marble
3 concrete
4 mortar

109 A mixture of finely ground cement and water is called

1 ferrite
2 silica
3 concrete
4 mortar

Unit B Concrete (110 - 132)

110 What material is most commonly used to reinforce concrete structures?

1 steel bars
2 large stones
3 glass pieces
4 glass fibers

111 Which one of the following is a fine filler or aggregate that is added to concrete to give it strength and take up space?

1 gypsum
2 stone
3 clay
4 sand

112 Which one of the following is a coarse filler or aggregate that is added to concrete to give it strength and to take up space?

1 sand
2 gypsum
3 stone
4 clay

113 Concrete is a mixture of

1 ceramic materials that have been fired in a furnace
2 cement and aggregates of fillers
3 stone, sand and calcium sulphate
4 ceramic materials, calcium sulphate and water

114 Concrete that is strengthened with wire mesh, iron rods and bars is known as

1 reinforced concrete
2 prestressed concrete
3 cured concrete
4 high tensile concrete

115 Concrete that is strengthened and sprung under tension by stretching cables inside of it is known as

1 reinforced concrete
2 prestressed concrete
3 cured concrete
4 high tensile concrete

116 Concrete which is highly resistant to the destructive effects of freezing and thawing is called

1 pretensioned
2 prestressed
3 reinforced
4 air-entrained

117 Terrazzo is a trade name for a mixture of

1 cement, sand and stone
2 special ceramic materials mixed with a resin binder
3 Portland cement, talc, crushed and sized colored sandstone
4 cement and marble chips in a gypsum batch mix

118 One of the most common mixture ratios for concrete is the

(1) 1-2-3 mix
(2) 2 to 1 batch mix
(3) 1/2-1/2 batch
(4) 60-40 mix

119 In a 1 to 2 to 3 mix by volume of concrete, the 2 indicates the amount of

1 gypsum
2 cement
3 sand
4 water

120 Which substance is produced by adding hydrated lime to a mixture of cement, sand and water?

1 stucco
2 cement
3 clay
4 glass

121 The function of cement in a concrete mix is to

1 add color to the concrete
2 produce the heat necessary to harden the concrete
3 expel the natural water in the mixture
4 act as a binder to hold the mixture together

122 Which chemical will cause concrete to set faster than normal?

1 aluminum chloride
2 calcium oxide
3 tin oxide
4 calcium chloride

123 How many operations should be involved in the pouring of concrete for an underwater structure?

(1) 1
(2) 2
(3) 3
(4) 4

124 The sheet iron cylindrical chute used to deposit concrete under water is called a

1 funnel
2 screen
3 bin
4 tremie

125 What process causes concrete to harden?

1 freezing
2 hydration
3 oxidation
4 dehydration

126 The normal time required for concrete to build up to maximum strength is

(1) 16 days
(2) 2 days
(3) 28 days
(4) 32 days

127 Which architect designed the graceful, soaring reinforced concrete sculptures at Kennedy Airport?

1 Eero Saarinen
2 Bernard Palissy
3 Richard Champion
4 Joseph Aspdin

128 A cantilever beam is supported

1 in the center, only
2 on one end, only
3 on both ends, only
4 on both ends and the center

129 To cure concrete means to

1 mix it with sand, water and stone
2 add special chemical hardeners to it
3 stress it internally
4 let it dry out and harden

130 A mixture of sand, lime, and cement that is used between stones, bricks or cinder blocks is known as

1 concrete
2 mortar
3 a decoration
4 an aggregate

131 Green concrete is concrete that

1 is colored before pouring
2 is colored after pouring
3 has not completely dried out
4 has completely dried out

132 Concrete becomes warm when it sets up because

1 it absorbs heat as it changes from a liquid to a solid
2 a chemical reaction occurs between the cement, sand and water
3 it absorbs heat as the water evaporates
4 a chemical reaction occurs between the concrete and the air

Unit C Structural Units (133 - 149)

133 In brickmaking, the process of getting the clay out of the ground is known as

1 benefication
2 gripping
3 winning
4 dredging

134 What device consists of a long trough and a shaft fitted with blades and is used to change the cleaned screened powdered clay into a moist workable mixture?

1 muller mixer
2 pug mill
3 auger
4 blender

135 Clay products such as drain tiles and bricks are formed by passing clay through a

1 metal die
2 muller press
3 pug mill
4 trim saw

136 Clay tile and drain tile are cut by a process known as

1 face-cutting
2 side-cutting
3 front-cutting
4 end-cutting

137 The cutting process used to cut bricks which results in rough top and bottom surfaces is known as

1 face-cutting
2 side-cutting
3 front-cutting
4 end-cutting

138 A thin, white incrustation which appears on masonry brick during periods of wet and dry weather results in a defect known as

1 efflorescence
2 salting
3 scumming
4 oxidizing

139 In which process are brick and drainage tiles made by forcing plastic clay through a molding die in a continuous stream?

1 stiff-mud process
2 soft-mud process
3 plastic-mud process
4 green-mud process

140 In which process are bricks made by molding tempered clay under pressure in a machine using multiple die molds?

1 stiff-mud process
2 soft-mud process
3 plastic-mud process
4 green-mud process

141 Products such as building brick, acoustical brick, drain tile, floor tile, and sewer pipe which require no paint, preservatives, or termite-proofing are known as

1 refractory clay products
2 structural clay products
3 ferrite clay products
4 vitrified clay products

142 The process of forcing a plastic body through an opening to obtain various shaped objects is known as

1 slip casting
2 drawing
3 extrusion
4 ram pressing

143 In addition to oil and water, which one of the following is used as a lubricant to prevent clay columns from tearing and ripping during the forming process?

1 steam
2 sodium silicate
3 talc
4 alcohol

144 The process used in the manufacture of structural clay products to increase the green strength, improve the workability of the clay and eliminate laminations and other defects is known as

1 de-airing
2 vulcanizing
3 vitrifying
4 permeating

145 When the molds used to form bricks are sanded to prevent the clay from adhering to the mold, the finished green brick is called a

1 cermet-struck brick
2 green-struck brick
3 water-struck brick
4 sand-struck brick

146 When the molds used to form bricks are dipped into water to prevent the clay from adhering to the mold, the finished green brick is called a

1	cermet-struck brick	3	water-struck brick
2	green-struck brick	4	sand-struck brick

147 What is the name of the first stage in the firing operation for structural clay products which removes the physical and chemical water from the clay objects?

1	salting	3	flashing
2	vitrification	4	water-smoking

148 Prior to the time that clay is formed into various structural shapes, a vacuum is maintained in a special chamber to

1 remove organic matter from the clay
2 remove trapped air from the clay
3 remove excess water from the clay
4 add metal oxides to give the clay a distinctive color

149 Which grade of brick would have the highest resistance to frost action?

1	Grade SW	3	Grade NW
2	Grade MW	4	Grade LW

Unit D Structures (150 - 154)

150 The most common method of concrete construction for large buildings is

1	slab	3	block
2	cast	4	shell

151 Concrete is cast into slabs and other shapes in containers called

1	forms	3	shells
2	cans	4	boxes

152 Concrete beams are given additional strength by stretching the reinforcing steel. This process is known as

1	post-positioning	3	prestressing
2	pull-creting	4	slinging

153 Concrete is settled into forms by

1 adding water
2 adding cement
3 pressing
4 vibrating

154 The smooth surface of concrete floors is produced by

1 sanding
2 troweling
3 vibrating
4 sealing

Unit E Refractions (155 - 159)

155 The standard size of fire bricks used to line the inside of industrial furnaces is

(1) 8 in. x 3 in. x 2 in.
(2) 8½ in. x 3½ in. x 2½ in.
(3) 9 in. x 4½ in. x 2½ in.
(4) 9½ in. x 4½ in. x 2½ in.

156 A refractory clay pyramid product which sags at a specific kiln temperature is called a

1 pyrometer
2 pyrometric cone
3 kiln setter
4 temperature indicator

157 What type of saw is used to cut hard inner fire brick?

1 hack saw
2 coping saw
3 circular saw
4 diamond saw

158 A refractory material used to prevent glazed objects from sticking to the kiln is kiln

1 cement
2 wash
3 mortar
4 salt

159 A refractory brick used to line the inside of a kiln is

1 common brick
2 wire cut brick
3 insulating brick
4 fire brick

Unit F Gypsum and Lime (160 - 168)

160 Quicklime is made of

1	calcium oxide	3	aluminum oxide
2	calcium dioxide	4	hydrated lime

161 Quicklime is used in vertical-shaft kilns to

1	drive off carbon dioxide	3	reduce heat
2	produce carbon dioxide	4	drive off water

162 A suspension and solution of hydrated lime in water is called

1	milk of lime	3	limestone slurry
2	quicklime	4	hydraulic lime

163 Limestone is used as a raw material for making

1	whiteware	3	glass
2	greenware	4	soil additives

164 Gypsum is a type of

1	hard mineral	3	hard clay
2	soft mineral	4	soft clay

165 Gypsum is heated to remove its water content. What is the remaining material called?

1	cement	3	glass
2	plaster of paris	4	lime

166 The earthy impure form of gypsum is called

1	rock gypsum	3	satin spar
2	selenite	4	gypsite

167 Gypsum that is made of transparent crystals is called

1	selenite	3	alabaster
2	gypsite	4	satin spar

168 Satin spar is a form of gypsum that is best described as

1 earthy
2 fibrous
3 a rock
4 a crystal

Unit G Abrasives (169 - 180)

169 Hard ceramic materials that will wear away the suface of another material are known as

1 refractories
2 synthetics
3 ferrites
4 abrasives

170 Abrasives made of flint, garnet, emery, corundum, or diamond are all classified as

1 synthetic abrasives
2 natural abrasives
3 manufactured abrasives
4 organic abrasives

171 The type of abrasive used in grinding wheels and other molded shapes is known as a

1 bonded abrasive
2 loose abrasive
3 coated abrasive
4 preformed abrasive

172 Which one of the following abrasive materials is synthetic?

1 garnet
2 flint
3 silicon carbide
4 emery

173 Abrasives made of silicon carbide, fused alumina, boron carbide, or cubic boron nitride are all classified as

1 synthetic abrasives
2 natural abrasives
3 organic abrasives
4 original abrasives

174 The type of abrasive that uses a backing material made from paper, cloth or a combination of both is known as a

1 bonded abrasive
2 loose abrasive
3 coated abrasive
4 preformed abrasive

175 Abrasives are classified according to their

1 age
2 firing temperature
3 hardness
4 durability

176 The hardness scale generally used to test the synthetic materials used in abrasives is known as the

1 Ohm scale of hardness
2 Mohs scale of hardness
3 Norton scale of hardness
4 Knoop scale of hardness

177 Grinding wheels are produced by mixing an abrasive with

1 hardeners
2 softeners
3 binders
4 fixers

178 Grinding blocks were first produced from natural

1 clay
2 stone
3 sponge
4 soil

179 Shellac, sodium silicate, resins and rubber compounds are all types of

1 nonvitreous bonding agents
2 organic bonding agents
3 carbide bonding agents
4 ceramic bonding agents

180 Sawdust is used to develop a porous structure during the manufacture of a manmade abrasive known as

1 crocus
2 silicon carbide
3 rouge
4 aluminum oxide

Unit H Industrial Organizations (181 - 185)

181 Which industrial organization works for the improvement of business conditions in the glass and pottery industry, sponsors research projects in educational institutions and provides scholarships for secondary, undergraduate and graduate students specializing in ceramics?

1 Glass Crafts of America Institute (GCAI)
2 Associated Glass and Pottery Manufacturers (AGPM)
3 Glass Container Industrial Research Corporation (GCIRC)
4 Flat Glass Marketing Association (FGMA)

182 An industrial organization that has developed standard specifications for practically all building materials based on laboratory tests and field experience is known as the

1 American Association of Refractory Products (AARP)
2 American Clay Production Institute (ACPI)
3 Association of Structural Clay Products (ASCP)
4 American Society for Testing Materials (ASTM)

183 What organization is responsible for improving the professional status of ceramic engineering and promoting high standards of ceramic education and high ethical engineering standards and practices?

1 National Institute of Ceramic Engineers (NICE)
2 Ceramic Educational Council (CEC)
3 American Ceramic Society (ACS)
4 Association of Ceramic Educators (ACE)

184 Which industrial organization is responsible for improving and extending the uses of Portland cement and concrete through scientific research and engineering field work?

1 Cement Manufacturers Association (CMA)
2 National Association of Cement Users (NACU)
3 Portland Cement Association (PCA)
4 Gypsum Products Association (GPA)

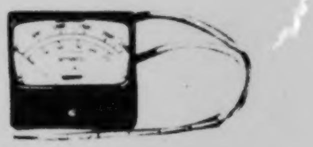
185 Which association prepares guides to aid manufacturers, consumers. and the general public in regard to nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance and quality of various ceramic products?

1 American Standards Association (ASA)
2 American Manufacturers Association (AMA)
3 Standard Products Association (SPA)
4 Association of Manufactured Products (AMP)

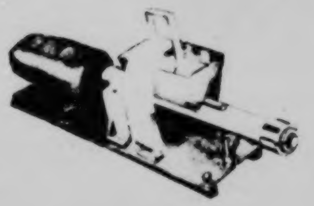
Group Questions (186 - 198)

186 Five types of equipment used for ceramics are shown in parts a through e. On the line at the left of each illustration, write the name of the type of equipment shown in the illustration. [5]

________________ a



________________ b



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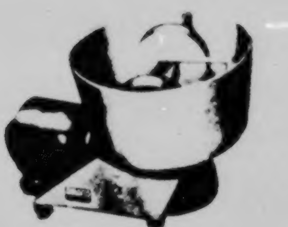

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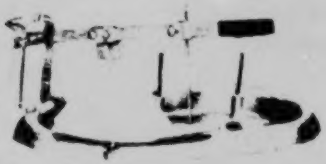
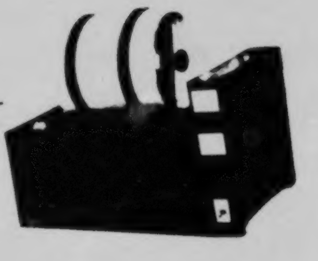


________________ e



187 On the line at the left of each enameling defect listed in parts a through e, write the number of the cause, chosen from the list below, that would produce that defect. [5]

Causes

(1) Uneven gum application
(2) Object overfired
(3) Object underfired
(4) Improper cleaning of base metal
(5) Uneven application of enamel
(6) Steel wool contamination
(7) Too thin a layer of enamel

_____ a Orange skin
_____ b Bled out
_____ c Lumpy and separations
_____ d Burnt edges
_____ e Pinholes and blisters

188 The identification symbol for a bonded abrasive is shown below. On the line at the left of parts a through e, identify what that part of the symbol stands for. [5]

A - 36 - L - 5 - V - 23

______________ a A
______________ b 36
______________ c L
______________ d 5
______________ e V

189 On the line at the left of each type of glaze color description listed in parts a through e, write the number of the colorant, chosen from the list below, that would produce that color glaze. [5]

Colorant

(1) Cobalt oxide
(2) Magnesium oxide
(3) Copper oxide
(4) Nickel oxide
(5) Lead oxide
(6) Iron oxide
(7) Tin oxide

_____ a Brown and gray

_____ b White

_____ c Blue

_____ d Red, yellow or brown

_____ e Green and blue

190 On the line at the left of each kiln temperature or temperature range listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes the color produced by that kiln temperature or temperature range. [5]

Color Descriptions

(1) Dark red
(2) Cherry red
(3) White to dazzling white
(4) Pale red
(5) Bright cherry red to orange
(6) Orange to yellow
(7) Light yellow to white

_____ (a) 885°F

_____ (b) 885° to 1200°F

_____ (c) 1650° to 2000°F

_____ (d) 2400° to 2800°F

_____ (e) 2800°F and higher

191 Ten products are listed in parts a through j below. If the product can be classified as a ceramic product, place the letter C in the space provided. If the product can not be classified as a ceramic product, place the letters NC in the space provided. [5]

______ a Sugar
______ b Acoustal brick
______ c Drainage tile
______ d Granite tombstone
______ e Pearl
______ f China
______ g Cement sidewalk
______ h Plastic trash can
______ i Pyrex dish
______ j plaster of paris

192 On the line at the left of each ceramic material or process listed in parts a through j, write the number of the major ceramic area, chosen from the list below, where that ceramic material or process would be used. (A number may be used more than once.) [5]

Ceramic Areas

(1) Concrete
(2) Structural clay
(3) Abrasives
(4) Refractories

______ a Aluminum oxide
______ b Rotary kiln
______ c Extrusion
______ d Blast furnace
______ e Garnet
______ f Clinker
______ g Silicon carbide
______ h Kiln stilts
______ i Stiff-mud process
______ j Fire brick

193 A student has been working on a coil construction project. In constructing this project, the student used 1816 grams of clay. The bisque firing took 7.5 hours with twenty objects in the kiln. The student glazed the project using two jars of glaze and then glost fired it for 7 hours with twenty-five objects in the kiln. Determine the total cost for this project. [5]

ADDITIONAL INFORMATION

1 One pound of clay costs $.12
2 One jar of glaze costs $1.50
3 The kiln uses 12.2 kilowatts of electricity in one hour
4 Each kilowatt costs $.03

Cost of clay ______
Cost of glaze ______
Cost of bisque fire ______
Cost of glost fire ______

Total ______

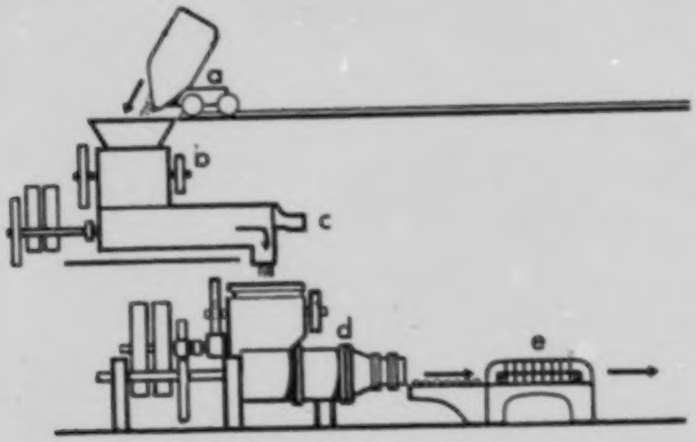
194 On the line at the left of each pyrometric cone value listed in parts a through e, write the number of the temperature equivalent, chosen from the list below, for that cone value. [5]

Temperatures

(1) 1641°F
(2) 1739°F
(3) 1803°F
(4) 1830°F
(5) 1915°F
(6) 1995°F
(7) 2048°F

______(a) 02
______(b) 05
______(c) 06
______(d) 07
______(e) 010

195 The diagram below shows the equipment used in the plastic wire-cut brickmaking process. On the line at the left of parts a through e, write the number of the name of the piece of equipment, chosen from the list below, that is indicated by that letter in the diagram. [5]



Equipment

(1) Secondary roller crusher
(2) Hopper
(3) Pug mill
(4) Cutting table
(5) Primary roller crusher
(6) Extruder
(7) Dry mixer

_____ a
_____ b
_____ c
_____ d
_____ e

196 On the line at the left of each job title listed in parts a through e, write the number of the description, chosen from the list below, that best describes the duties of that job. [5]

Descriptions

(1) Designs buildings and structures
(2) Plans the location and support for structures
(3) Plans the heat and lighting of structures
(4) Plans the framework of structures
(5) Carries out the labor tasks of construction
(6) Directs a group of workers on the job
(7) Plots the land to prepare a site for construction

_____ a Architect
_____ b Structural engineer
_____ c Surveyor
_____ d Foreman
_____ e Journeyman

197 On the line at the left of each material listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that material. [5]

Descriptions

(1) A material made from cement, lime, sand and water
(2) A material applied as an outside covering on a wall
(3) A material made from limestone, clay and gypsum
(4) A material made from cement, sand, stone and water
(5) A material made from marble chips, cement, lime, sand and water
(6) A filler material made of gravel
(7) A filler used between joints

_____ a Concrete
_____ b Aggregate
_____ c Stucco
_____ d Mortar
_____ e Terrazzo

198 On the line at the left of each term listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that term. [5]

Descriptions

(1) Form work that receives a slab or floor of cement
(2) Stakes used to guide elevation and outline a building
(3) Braces used to increase the stability of concrete forms
(4) A system of supports for holding forms when pouring a slab of concrete
(5) An elevated platform used to support workers, tools and materials
(6) A column built into a wall to provide support

_____ a Batterboards
_____ b Shores
_____ c Pilaster
_____ d Deck
_____ e Scaffold

Industrial Arts Examination Materials
CERAMICS

Scoring Key

Multiple-Choice Questions

(1) 3
(2) 4
(3) 1
(4) 4
(5) 2
(6) 1
(7) 1
(8) 4
(9) 2
(10) 1
(11) 4
(12) 2
(13) 4
(14) 4
(15) 3
(16) 4
(17) 2
(18) 1
(19) 2
(20) 3
(21) 4
(22) 1
(23) 2
(24) 4
(25) 2
(26) 1
(27) 3
(28) 2
(29) 1
(30) 2
(31) 2
(32) 4
(33) 1
(34) 2
(35) 2
(36) 4
(37) 3
(38) 2
(39) 1
(40) 3
(41) 1
(42) 2
(43) 1
(44) 4
(45) 1
(46) 3
(47) 1
(48) 4
(49) 3
(50) 1
(51) 4
(52) 2
(53) 1
(54) 1
(55) 2
(56) 1
(57) 4
(58) 2
(59) 3
(60) 1
(61) 3
(62) 2
(63) 2
(64) 3
(65) 2
(66) 1
(67) 2
(68) 3
(69) 1
(70) 4
(71) 3
(72) 4
(73) 4
(74) 4
(75) 3
(76) 3
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(78) 3
(79) 3
(80) 3
(81) 4
(82) 3
(83) 1
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(89) 2
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(91) 1
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(93) 4
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(95) 4
(96) 3
(97) 4
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(100) 1
(101) 4
(102) 3
(103) 4
(104) 2
(105) 3
(106) 1
(107) 3
(108) 3

(109) 4
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(144) 1
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(146) 3
(147) 4
(148) 2
(149) 1
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(157) 4
(158) 2
(159) 4
(160) 1
(161) 1
(162) 1
(163) 3
(164) 2
(165) 2
(166) 4
(167) 1
(168) 2
(169) 4
(170) 2
(171) 1
(172) 3
(173) 1
(174) 3
(175) 3
(176) 4
(177) 3
(178) 2
(179) 4
(180) 2
(181) 2
(182) 4
(183) 1
(184) 3
(185) 1

Industrial Arts Examination Materials
CERAMICS

Scoring Key

Group Questions

(186)	a	Pyrometer
	b	Pugmill
	c	Muller-Mixer
	d	Jiggering Machine
	e	Ball Mill

(187)	a	3
	b	7
	c	5
	d	2
	e	4

(188)	a	Abrasive Type
	b	Grain Size
	c	Grade: Soft-Medium-Hard
	d	Structure: Dense-Open
	e	Bond Type

(189)	a	4
	b	7
	c	1
	d	6
	e	3

(190)	a	4
	b	1
	c	6
	d	7
	e	3

(191)	a	NC
	b	C
	c	C
	d	C
	e	NC
	f	C
	g	C
	h	NC
	i	C
	j	C

(192)	a	3
	b	1
	c	2
	d	4
	e	3
	f	1
	g	3
	h	4
	i	2
	j	4

(193)	Cost of Clay	$ .48
	Cost of Glaze	3.00
	Cost of Bisque Fire	.14
	Cost of Glost Fire	.10
	Total	$3.72

(194) a 7
b 5
c 4
d 3
e 1

(195) a 2
b 5
c 7
d 3
e 4

(196) a 1
b 4
c 7
d 6
e 5

(197) a 4
b 6
c 2
d 1
e 5

(198) a 2
b 4
c 6
d 1
e 5

Industrial Arts Examination Materials

GRAPHIC ARTS

Directions (1-197): On your answer paper, write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Photographics

Unit A Cameras (1-14)

1 What is the main advantage of the single lens reflex camera over other types of cameras?

1 It has a noninterchangeable lens.
2 The shutter is between the lens.
3 It has split-image focusing.
4 It has through-the-lens viewing.

2 Which one of the following cameras is a single lens reflex camera?

1 Kenro
2 Graphlex XL
3 Pentax
4 Rolliflex

3 Which one of the following action-stopping techniques tends to blur the background of a photograph?

(1) peak of action
(2) panning
(3) 45° angle of action
(4) 90° angle of action

4 In a camera, the focal length is equal to the

1 length of the film plane
2 distance between the lens and the film plane
3 diameter of the lens
4 length of the film

5 What is an advantage of the wide-angle (short focal length) lens over other types of lenses?

1 It has a smaller depth of field.
2 The distance between objects is smaller.
3 It has a wider angle of view.
4 It produces a less distorted perspective.

6 What is an advantage of the telephoto (long focal length) lens over other types of lenses?

1 It has a greater depth of field.
2 It produces a less distorted perspective.
3 It brings distant objects closer by magnification.
4 It has a wider angle of view.

7 A convergent lens is a lens that

1 always forms a virtual image
2 is sometimes called a negative lens
3 is thicker at the center than at the edges
4 is thicker at the edges than at the center

8 Which type of lens should be used to photograph a large group?

1 telephoto
2 wide angle
3 normal
4 close-up

9 Which type of lens should be used to take a picture of a distant subject?

1 telephoto
2 wide angle
3 normal
4 close-up

10 Which lens opening will allow the least amount of light to reach the film plane?

(1) f/1.2
(2) f/2
(3) f/4
(4) f/8

11 Which f-number setting results in the largest lens opening?

(1) f/1.4
(2) f/2
(3) f/4
(4) f/8

12 When the lens setting of a camera is changed from f/2 to f/2.8, the amount of light entering the camera will

1 be halved
2 be doubled
3 remain the same
4 increase four times

13 Which shutter speed will allow the least amount of light to reach the film plane?

(1) 1 second
(2) 1/60 second
(3) 1/125 second
(4) 1/250 second

14 Which lens opening results in the greatest "depth of field"?

(1) f/1.4
(2) f/2
(3) f/8
(4) f/4

Unit B Exposures (15-22)

15 Which type of exposure meter is most widely used today?

(1) CDS cell meter
(2) extinction type meter
(3) selenium cell meter
(4) tungsten meter

16 What type of exposure meter should be used to read the amount of light falling on a subject?

1 spot meter
2 reflected light meter
3 incident light meter
4 extinction meter

17 Which ASA rating film would be most suitable for low light-level exposures?

(1) 1600 ASA
(2) 400 ASA
(3) 125 ASA
(4) 25 ASA

18 Which type of lighting is used to lighten shadow areas for a portrait?

1 key light
2 hair light
3 side light
4 fill light

19 Which one of the following light sources will produce the most light?

(1) No.1 photoflood
(2) No.2 photoflood
(3) No.3 photoflood
(4) 100-watt household bulb

20 When taking a picture in the evening of an object several hundred feet away, a photographer should use

1 a small flashbulb
2 an electronic flash
3 flood lamps
4 a time exposure

21 Which process is used to eliminate undesirable reflected light inside a camera?

1 absorption
2 filtration
3 polarization
4 refraction

22 A picture's "depth of field" is determined mostly by the

(1) speed of the shutter
(2) ASA rating of the film
(3) amount of light reaching the film
(4) size of the aperture opening

Unit C Films (23-33)

23 Panchromatic film is sensitive to

1 yellow light, only
2 red light, only
3 blue light, only
4 the entire spectrum of visible light

24 Which film is used to make black-and-white slides?

1 Kodalith
2 Panatomic-x
3 Tri-x pan
4 Tri-x ortho

25 What is the advantage of panchromatic films compared with orthochromatic or infrared films?

1 They have a faster film speed.
2 A red safelight can be used while the film is being developed.
3 They give the most natural-looking colors in tones of the black-and-white scale.
4 They can be stored for longer periods of time.

26 What is the main advantage of high film speeds over low film speeds?

1 The film development time is always less.
2 The pictures are always easier to enlarge.
3 The pictures will always have less graininess.
4 Pictures can be taken with less light.

27 Film contrast refers to a film's

1 speed
2 ability to distinguish among colors
3 ability to distinguish among tones in the brightness scale
4 ability to reflect light

28 A tungsten film is exposed to daylight. When the film is developed, it will have a

1 reddish appearance
2 bluish appearance
3 yellowish appearance
4 correct color balance

29 The disadvantage of graininess in film is that it

1 becomes too visible in enlargements
2 makes film development difficult
3 requires long exposure times
4 makes the prints turn brown

30 Unexposed silver salts are removed from film during the process of

1 reducing
2 fixing
3 toning
4 bronzing

31 Which chemical is used to make the light-sensitive emulsion found on film?

1 cellulose acetate
2 silver nitrate
3 cellulose
4 silver bromide

32 What is the major ingredient in a film emulsion?

1 cellulose acetate
2 potassium nitrate
3 silver bromide
4 sodium sulfite

33 What is the major ingredient in film backing?

1 cellulose acetate
2 potassium nitrate
3 silver bromide
4 sodium sulfite

Unit D Chemistry (34-42)

34 When processing film, the proper sequence of events is

1 washing, fixing, stopping, and developing
2 fixing, stopping, developing, and washing
3 developing, fixing, stopping, and washing
4 developing, stopping, fixing, and washing

35 When film is being processed, what stops the developing action?

1 fixer	3 water bath
2 hydroxide	4 hypoclearing agent

36 During film processing, why is it important not to contaminate the developer with the fixer?

1 The developing time will be increased.
2 The developing time will be decreased.
3 They will neutralize each other.
4 The wetting agent will become overactive.

37 During film processing, the purpose of agitation is to

1 reduce the washing time
2 reduce the fixing time
3 enable the developer to work more effectively
4 eliminate the need for a wetting agent

38 Why is a wetting agent used after a film has been processed?

1 It allows the fixer to penetrate better.
2 It helps reduce developing time.
3 It allows the water to drain off the film evenly while the film is drying.
4 It eliminates the need for a stop bath.

39 What four basic ingredients are found in most modern developers?

1 stabilizer, activator, rinsing agent, fixing agent
2 activator, preservative, fixer, rinsing agent
3 reducer, preservative, accelerator, restrainer
4 stabilizer, fixer, activator, accelerator

40 Which is not a basic black-and-white developer?

(1) Dektol	(3) Microdol
(2) D-76	(4) Kodabromide

41 Which chemical is added to some fixing agents to neutralize the action of the developer?

1 borax	3 acetic acid
2 ammonia	4 citric acid

42 Which chemical is used to remove unexposed silver salts?

1 sodium thiosulphate	3 silver nitrate
2 acetic acid	4 potassium bromide

Unit E Development (43-51)

43 Too low a developer temperature will affect the development of a film by causing the

1 development time to increase
2 film to curl
3 developing chemicals to deteriorate
4 negative to be too grainy

44 When film is being developed, what will happen if too high a developer temperature is used?

1 The emulsion will soften and swell too much.
2 The development time will increase.
3 The picture contrast will decrease.
4 The "latent image" will be eliminated.

45 In film development, the purpose of the fixing bath is to

1 completely stop the developer action
2 soften the film emulsion
3 dissolve the unexposed and undeveloped silver crystals
4 decrease the film contrast

46 The main advantage of using ready-mixed developers is that they

1 are more economical
2 are easier to prepare
3 require less storage space
4 last longer

47 Which chemical is a reducing agent?

1 Metol
2 sodium sulfite
3 borax
4 potassium bromide

48 Which chemical will slow down the oxidation of the developer?

1 Metol
2 sodium sulfite
3 borax
4 potassium bromide

49 The best developer for a fine grain film is

(1) Dektol
(2) D-76
(3) Microdol
(4) Kodalith

50 The temperature of paper developer should be between

(1) 60°-64° F
(2) 65°-67° F
(3) 68°-75° F
(4) 76°-80° F

51 Which chemical is added to water and acts as an effective stop bath?

1 borax
2 ammonia
3 acetic acid
4 citric acid

Unit F Prints (52-70)

52 What type of photographic paper should be used when making contact prints?

1 Medalist
2 Velox
3 Kodalith
4 mural

53 Which type of paper will reproduce the greatest range of tones from a negative?

1 glossy
2 matte
3 semiglossy
4 semimatte

54 What is the advantage of a resin-coated paper over other types of paper?

1 It can be drum dried.
2 It requires less fixing.
3 It does not require washing.
4 It can be air dried.

55 Which contrast of paper should be used with a contrasty negative?

(1) #1
(2) #2
(3) #3
(4) #4

56 Which one of the photographic papers listed below is used for making contact prints?

1 Velox
2 Polycontrast
3 Medalist
4 Polylure

57 The easiest method of spot printing is

1 burning in
2 vignetting
3 cropping
4 dodging

58 The first step in spotting is

1 removing the black spots
2 removing the white spots
3 toning
4 bronzing

59 The process of stopping light from striking certain areas of a print is called

1 diffusing
2 cropping
3 dodging
4 burning in

60 Photographic paper is sometimes fogged in a controlled manner to reduce the contrast of a section of a print. What is this process called?

1 dodging
2 vignetting
3 toning
4 flashing

61 Which process is used to eliminate distracting or unwanted backgrounds?

1 dodging
2 vignetting
3 toning
4 flashing

62 Which process is used to enlarge an isolated section of a negative?

1 dodging
2 vignetting
3 cropping
4 etching

63 The process of eliminating black spots on a print is called

1 toning
2 ferrotyping
3 spotting
4 etching

64 The process of filling in white areas on a print is called

1 toning
2 ferrotyping
3 spotting
4 etching

65 A glossy print surface can be obtained by

1 ferrotyping
2 drying the print face up on a blotter
3 drying the print face up on a lithographic stone
4 drying the print face down

66 Which type of paper surface will ferrotype most easily?

1 matte surface
2 semimatte surface
3 glossy surface
4 dull surface

67 What type of finish would be found on a photographic print with a dull surface?

1 glossy
2 matte
3 semiglossy
4 semimatte

68 When making a contact print, the size of the print will always be

1 smaller than the negative
2 the same size as the negative
3 twice the size of the negative
4 four times the size of the negative

69 Which emulsion should be used for projection printing papers?

1 silver bromide
2 chlorobromide
3 silver chloride
4 Kodabromide

70 Light sensitive materials should be stored in areas that are

1 warm and dry
2 cool and moist
3 warm and moist
4 cool and dry

Unit G Evaluation (71-80)

71 What is the most important element in composition?

1 center of interest
2 focus
3 picture mergers
4 exposure

72 The best advice to give to an amateur photographer is to

1 buy an expensive camera
2 use only chromotype films
3 always use an electronic flash
4 fill the viewer with the subject

73 A picture will usually have good composition if the

1 picture is kept simple
2 correct film is used
3 correct exposure is used
4 picture is developed carefully

74 One of the most common composition faults of amateur photographers is

1 using an improper film
2 including a poor background
3 using improper lighting
4 using an incorrect exposure

75 What is the tone or mood of a photographic print in which there is little or no shading from white to black?

1 chiaroscuro
2 notan
3 perspective
4 tonal

76 Shadings that range from pure white to pure black are called

1 chiaroscuro
2 notan
3 perspective
4 tonal

77 When using a tungsten film outdoors, a photographer should use

1 an electronic flash
2 blue flashbulbs
3 a filter
4 a fast shutter speed

78 Tungsten-type film is used mainly for

1 outdoor night photography
2 outdoor day photography
3 indoor natural light photography
4 indoor artificial light photography

79 The illusion of third-dimensional depth in a print is called

1 chiaroscuro	3 perspective
2 notan	4 tonal

80 What type of grain structure do most very fast films have?

1 fine grain
2 moderately fine grain
3 medium grain
4 coarse grain

Unit H Reproduction (81-91)

81 The term chroma refers to the

1 name of a color
2 degree of grayness of a color
3 supplement of a color
4 complement of a color

82 The word hue refers to a color's

1 name	3 lightness or darkness
2 degree of grayness	4 complement

83 The term value refers to a color's

1 name	3 lightness or darkness
2 degree of grayness	4 complement

84 Which are the subtractive primary colors?

1 magenta, yellow, and blue
2 red, green, and cyan
3 yellow, cyan, and magenta
4 magenta, green, and blue

85 Which are the additive primary colors?

1 magenta, yellow, and blue
2 red, green, and blue
3 yellow, cyan, and magenta
4 magenta, green, and blue

86 When making the color separation negative for printing cyan, what type of filter is needed?

1 red	3 magenta
2 yellow	4 blue

87 A red filter will

1 reflect red light
2 refract red light
3 transmit red light, only
4 transmit all colors except red light

88 The purpose of a halftone screen is to

1 make it possible to print continuous tone pictures
2 filter out unwanted colors
3 make it possible to print line drawings
4 keep excess light off a process camera

89 The clearest halftones are made from a screen with

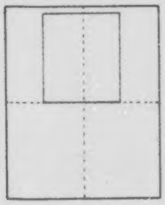
(1) 50 dots/inch	(3) 90 dots/inch
(2) 70 dots/inch	(4) 150 dots/inch

90 What type of developer is used to produce a halftone negative?

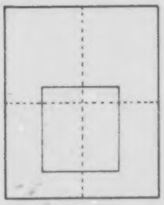
(1) Microdol	(3) D-11
(2) Kodalith a & b	(4) Dektol

91 Which diagram shows how a print should be mounted?

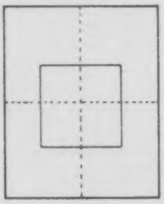
1.



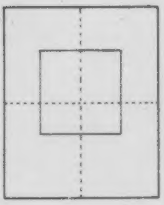
2.



3.



4.



Unit I Careers and Industry (92-99)

92 Which one of the following fields offers the widest opportunities to motion picture photographers?

1 television	3 entertainment
2 education	4 medicine

93 The largest employer of darkroom technicians is

1 photo studios	3 photofinishers
2 chemical plants	4 advertising agencies

94 In which photographic field is a thorough knowledge of optics and mathematics most important?

(1) aerial	(3) law enforcement
(2) X-ray	(4) news

95 In which photographic field are new fiber optics most often used?

1 industrial photography
2 photo-instrumentation
3 general photography
4 free-lance photography

96 Which is one of the least publicized fields of photography?

(1) X-ray
(2) aerial
(3) law enforcement
(4) industrial

97 Which one of the following photographic fields offers employment in both industrial and medical establishments?

(1) X-ray
(2) photo-instrumentation
(3) commercial
(4) education

98 The main responsibility of a darkroom technician is to

1 remove film from the camera
2 take photographs
3 repair cameras
4 take care of the developing equipment

99 What would be one major responsibility of a portrait photographer?

1 handling movie cameras
2 handling small format cameras
3 handling interior lighting
4 working with nature

Part II Offset

Unit A Lithography (100-108)

100 Which printing process is used to make packaging materials?

1 gravure	3 dry offset
2 thermography	4 intaglio

101 Upon which principle is offset lithography based?

1 Ink will print on paper.
2 Grease and water will not mix.
3 Ink will not stick to a rubber blanket.
4 A fountain solution makes ink unnecessary.

102 Another name for lithographic printing is

1 relief	3 gravure
2 intaglio	4 offset

103 Who invented lithography printing?

1 Karl Klitsch	3 Alois Senefelder
2 John Gutenberg	4 Rudolph Simmon

104 When was the first lithographic print made?

1 before 1800
2 between 1800 and 1875
3 between 1875 and 1925
4 after 1925

105 In modern offset lithography, the part of the printing press that actually prints on the paper is the

1 impression cylinder
2 plate cylinder
3 blanket cylinder
4 ink form roller

106 The purpose of a fountain solution is to

1 distribute the ink over the blanket evenly
2 distribute the ink over the plate evenly
3 keep the impression cylinder clean
4 keep the ink off the non-image areas of the plate

107 The form roller on an offset press is the roller that

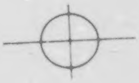
1 contacts the blanket cylinder
2 contacts the plate cylinder
3 contacts the impression cylinder
4 supplies the ink for printing

108 On what surface texture is the process of offset reproduced?

1 relief
2 smooth
3 etched
4 raised

Unit B Copy Preparation (109-124)

109 Which type of preparation mark is illustrated by the circle below?



1 copy mark
2 mark-up mark
3 proof mark
4 register mark

110 A halftone negative can be made from a

1	rule form	3	photograph
2	typed copy	4	drawing

111 A halftone reproduction is an image containing

1 no dots
2 all light dots
3 all heavy dots
4 a gradation of dots

112 Which screen gives the best halftone detail?

(1) 65-line screen
(2) 100-line screen
(3) 110-line screen
(4) 300-line screen

113 Register marks are used to

1 position color
2 prepare artwork
3 scale photographs
4 supplement artwork

114 Line copy is copy which contains

1 photographs, only
2 lines, only
3 photographs and areas of single tones
4 lines and areas of single tones

115 How do most cameramen place copy on a copyboard?

1 sideways
2 upside down
3 right side up
4 face down

116 Which one of the following is a cold type media method used for copy preparation?

1 spec-type
2 stereotype
3 linotype
4 intertype

117 What does a wax coater take the place of during copy preparation?

1 overlays
2 color register
3 waxed paper
4 rubber cement

118 When reducing a photograph that is 8 by 10 inches, the 10-inch dimension is reduced to 7½ inches. What will the 8-inch dimension be reduced to?

(1) 5½ in.
(2) 6 in.
(3) 6½ in.
(4) 7 in.

119 What is the purpose of proofreading?

1 to make sure no mistakes are made before pasteup
2 to make corrections before going to the composing machines
3 to make sure the layout is correct
4 to correct the copy before it goes to the camera

120 Which two types of chemicals are used in a stabilization processor?

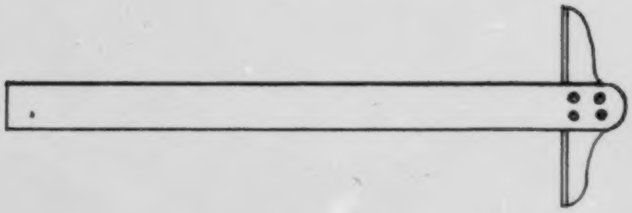
1 a developer and a stop bath
2 a fixer and a developer
3 an activator and a stabilizer
4 a developer and an activator

121 About how long does it take to make a print with a stabilization processor?

1 ten seconds
2 two minutes
3 one-half hour
4 four minutes

122 The piece of equipment shown below is called a

(1) line gauge
(2) T-square
(3) ruler
(4) yardstick



123 Which process is performed first during an offset printing job?

1 stripping
2 opaquing
3 screening
4 preparing the artwork

124 Which type of composition is most often used in preparing offset copy?

1 machine typecasting
2 hand lettering
3 cold typesetting
4 hot typesetting

Unit C Photography (125-141)

125 Which one of the following is produced by a process camera?

1 line copy
2 halftone copy
3 negative
4 plate

126 Compared to other types of process cameras, the main advantage of a vertical process camera is that it

1 has a faster shutter speed
2 requires less floor space
3 is much more rugged
4 does not have to be housed in a darkroom

127 Which is an advantage of a horizontal-type process camera over other types of cameras?

1 The copy board can be outside the darkroom.
2 It uses less floor space.
3 It uses less expensive film.
4 It uses smaller wattage lamps.

128 The reproduction size on a process camera can be changed by regulating the

(1) bellows extension
(2) lens aperture
(3) f-stop
(4) exposure time

129 What type of camera is used for offset copy work?

1 process camera
2 press camera
3 graphlex camera
4 reflex camera

130 A gallery camera is a camera that is

1 completely inside the darkroom
2 completely outside the darkroom
3 smaller than all other cameras
4 larger than all other cameras

131 Compared to other types of screens, the main advantage of the magenta contact screen for negatives is that it

1 provides better protection for the negative
2 can be used on all types of cameras
3 allows additional control of the range of tones of the halftone
4 has a greater highlight density

132 Which type of film should be used to make a line negative?

1 Panchromatic
2 Kodachrome
3 Anscochrome
4 Kodalith

133 Which type of film can be used to make halftones without a halftone screen?

1 Panchromatic film
2 Orthochromatic film
3 Diazo film
4 Autoscreen film

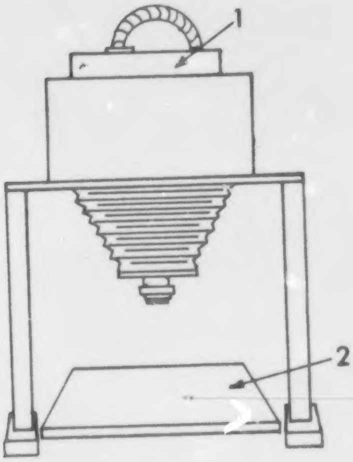
134 Why is a flash exposure needed for making a halftone negative?

1 to improve the highlight dot patterns
2 to reduce development time
3 to control contrast and shadow dot size
4 to eliminate the need for a contact screen

135 When Ortho film is being used, the safe light should be

1 green	3 red
2 amber	4 yellow

Base your answers to questions 136 through 138 on the camera shown in the diagram below.



136 Which kind of camera is shown in the diagram?

1 vertical process camera
2 reflex copy camera
3 single lens reflex camera
4 horizontal process camera

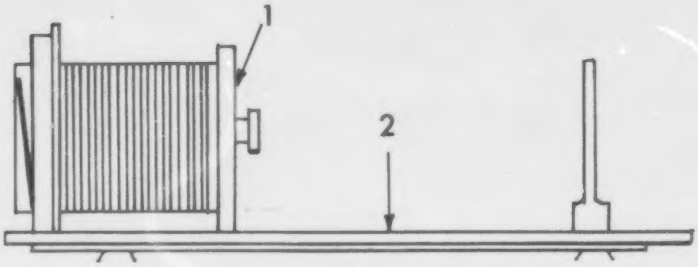
137 What is the name of part 2 of the camera?

1 focal plane
2 lens board
3 copyboard
4 vacuum back

138 What is the name of part 1 of the camera?

1 copyboard
2 focal plane
3 shutter board
4 vacuum frame

Base your answers to questions 139 through 141 on the diagram of a camera below.



139 What kind of camera is shown in the diagram?

1 vertical process camera
2 reflex copy camera
3 single-lens reflex camera
4 horizontal process camera

140 What is the name of part 1 of the camera?

1 lens board
2 focal plane
3 bed
4 vacuum frame

141 What is the name of part 2 of the camera?

1 lens board
2 focal plane
3 bed
4 vacuum frame

Unit D Platemaking (142-155)

142 The main advantage of presensitized plates over other metal offset plates is that they

1 last longer
2 are cheaper
3 are more convenient to use
4 require no platemaking equipment

143 The lacquer coating must be properly applied to an additive offset plate in order to

1 insure good register of the copy
2 make the press cleanup easier
3 insure longer plate runs
4 enable the press to print two colors at the same time

144 One use of a solution of gum arabic is to

1 clean off the negative before burning the plate
2 shorten the exposure time for the plate
3 prevent oxidation of the plate
4 shorten the press run

145 The purpose of opaquing a negative is to

1 get rid of the pinholes and other showthrough defects
2 make the image brighter
3 allow good register with the plate
4 indicate to the stripper where to cut in the negative

146 Negatives should be accurately placed when stripping a flat in order to

1 give the picture more contrast
2 make opaquing unnecessary
3 ensure the correct placement of the image on the plate
4 reduce the cost of negatives

147 Stripping is the process of

1 peeling the ink off the plate cylinder
2 mounting the negatives on the yellow (goldenrod) masking sheet
3 lining the offset plate up to the master cylinder
4 removing the slip sheets from the offset master

148 Which part of the negative will eventually become the image area on the plate?

1 all of the opaque border around the outside of the negative
2 only the opaque parts of the negative
3 only the transparent parts of the negative
4 only where the negative is attached to the masking sheet

149 When laying out a flat, a sheet gripper area should be included in order to provide

1 space for the platemaking equipment to hold the plate
2 space for the stripper to place his T-square on the plate
3 handling room for the platemaker to work
4 a holding area for the offset press to pull the paper through the press

150 The most important quality of photographic masking paper is that it must

1 be black
2 absorb actinic light
3 have an adhesive back
4 be neutral in color

151 The image area of a photo offset plate must be able to

1 absorb water
2 repel water
3 repel ink
4 absorb ink

152 In the negative stripping process, pinhole marks can be corrected by using

1 opaque compound
2 Scotch tape
3 masking tape
4 India ink

153 A flat that is ready for platemaking consists of a

1 plate and a negative
2 gray scale and a negative
3 plate and a mask
4 negative and a mask

154 Which one of the following light sources is best for exposing a photo offset plate?

1 a photo spotlight
2 a 200-watt lamp
3 a carbon arc lamp
4 a no. 2 photoflood

155 During a plate exposure, the plate and the negative are held together by

1 vacuum pressure
2 pressure clamps
3 sponge rubber
4 compressed air

Unit E Duplicating (156-164)

156 Which is the one ingredient that is common to all fountain solutions?

1 bichromate
2 oil
3 phosphate
4 water

157 What type of process is stencil duplicating?

1 wet
2 photographic
3 dry
4 intaglio

158 What type of process is electrostatic duplicating?

1 wet
2 photographic
3 dry
4 intaglio

159 Another name for stencil duplicating is

1 gravure
2 relief
3 seriography
4 lithography

160 What is another name for electrostatic duplicating?

1 seriography
2 Xerography
3 mitography
4 lithography

161 Printing off a flat surface is performed by

1 letterpress duplication
2 intaglio duplication
3 spirit duplication
4 gravure duplication

162 Which part of an offset press produces the printed image?

1 ductor roller
2 impression cylinder
3 blanket
4 plate cylinder

163 The maximum number of readable copies that can be duplicated by a spirit duplicator from a single spirit master is approximately

(1) 100
(2) 300
(3) 1,000
(4) 3,000

164 A spirit master should be written on with a

1 felt-tip pen
2 crayon
3 ballpoint pen
4 fountain pen

Unit F Presses (165-179)

165 When an offset press is being washed up, it should be run at

1 minimum speed
2 half speed
3 three-quarter speed
4 full speed

166 The purpose of the dampening system on an offset press is to

1 keep the water off the image area of the blanket
2 keep the ink off the impression cylinder
3 keep the ink off the non-image area of the plate
4 evenly distribute the ink on the plate

167 A web press is a press that

1 cuts roll paper into sheets
2 prints cardboard boxes
3 feeds paper from a roll
4 stencils on curved surfaces

168 A flatbed offset press is used for

1 plateproofing and printing on heavy stock
2 stenciling bottles
3 printing rotogravure sections
4 stenciling large plastic signs

169 Which one of the following machines prints both sides of a piece of paper at the same time?

1 flat bed press
2 perfecter press
3 rotary press
4 spirit duplicator

170 What is the purpose of the joggers on the paper feedboard of an offset duplicator?

1 to produce better registration
2 to increase delivery speed
3 to increase double sheet protection
4 to increase the ink distribution

171 The blanket clamp screws on a multilith 1250 press should be tightened with

1 pliers
2 fingers
3 a screwdriver
4 a wrench

172 After the paper is jogged into the feeding position on an ATF Chief 15, it is carried through the impression cycle by the

1 stop bar
2 jogger
3 feedboard
4 tumbler grippers

173 Too little pressure between the ink form roller and the plate on an offset duplicator will cause

1 scum
2 excess wear
3 a weak image
4 a heavy image

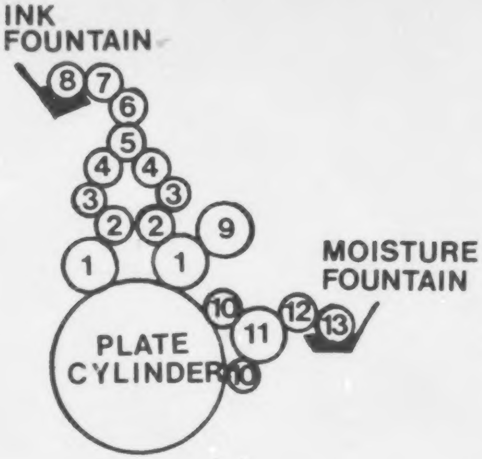
174 A dry-offset plate is a

1 stencil plate
2 deep etch plate
3 standard type of surface plate
4 direct image plate

175 The maximum number of sheets per hour that can be run on a multilith 1250 offset press is

(1) 500-950
(2) 1,000-3,500
(3) 4,000-7,500
(4) 8,000-10,000

Base your answers to questions 176 through 178 on the diagram below.


INK FOUNTAIN
8
7
6
5
4
4
3
3
2
2
9
1
1
MOISTURE FOUNTAIN
10
11
12
13
PLATE CYLINDER
10

176 The number 10 rollers are the

1 ink oscillating rollers
2 blanket rollers
3 dampening form rollers
4 ink form rollers

177 The number 1 rollers are the

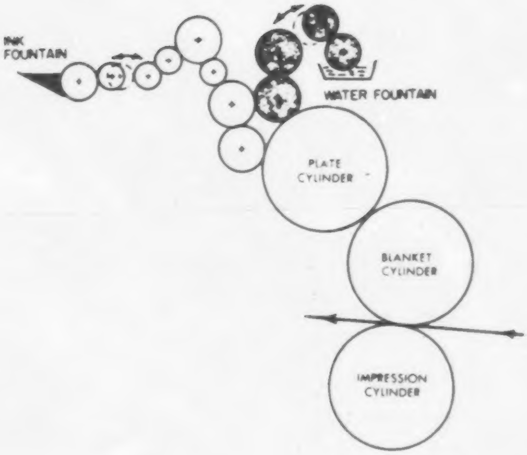
1 ink oscillating rollers
2 blanket rollers
3 dampening form rollers
4 ink form rollers

178 Which type of roller configuration does the diagram represent?

1 standard platen press roller arrangement
2 offset press using a conventional inking and dampening system
3 offset press using a Simflo inking and dampening system
4 offset press using a combined inking system

---

179 Which type of roller configuration is shown in the diagram below?


INK FOUNTAIN
WATER FOUNTAIN
PLATE CYLINDER
BLANKET CYLINDER
IMPRESSION CYLINDER

1 standard platen press roller arrangement
2 offset press using a conventional inking and dampening system
3 offset press using a combined inking and dampening system
4 a spirit duplicator roller arrangement

Unit G Bindery (180-188)

180 A large sheet of paper with a number of pages printed on it is called a

1	layout	3	flat
2	mask	4	signature

181 Which type of binding is usually used for large thick books?

1	side-wire	3	saddle-wire
2	perfect	4	spiral

182 Which type of binding is usually used for textbooks?

1	spiral	3	side-wire
2	saddle-wire	4	case

183 Which method of binding should be used when additional sheets may be added to a publication?

1	saddle-stitched	3	loose-leaf
2	perfect-bound	4	case-bound

184 Which one of the following is the most expensive method of binding?

1	saddle-wire	3	perfect
2	loose-leaf	4	case

185 Assembling sheets into sequence is called

1	jogging	3	collating
2	grouping	4	ruling

186 To align paper so it will feed through a machine properly, it must first be

1 padded
2 folded
3 flared
4 jogged

187 Hot stamping is performed with metal dies and

1 ink
2 foil
3 paint
4 glue

188 Punching holes in paper before binding is done by

1 drilling
2 stapling
3 ruling
4 collating

Unit H Careers and Industry (189-197)

189 What is the job of a lithographic artist?

1 making negatives
2 making layouts
3 retouching negatives
4 operating an offset press

190 What is a dot etcher?

1 a stripper
2 a platemaker
3 a cameraman
4 a lithographic artist

191 What work does a lithographic artist perform?

1 tusching
2 stripping
3 opaquing
4 printing

192 One duty of the foreman in a graphic arts plant is to

1 discharge employees
2 bill customers
3 hire employees
4 schedule work

193 Which one of the following occupations would be the first to handle a printing assignment?

1 platemaker
2 lithographic pressman
3 cameraman
4 stripper

194 What is the apprenticeship time for a lithographic pressman?

(1) 1 to 2 years
(2) none
(3) 6 months
(4) 4 to 5 years

195 Which one of the following occupations would most likely bring the highest hourly rate?

1 multilith press operator
2 platemaker
3 first pressman on large offset presses
4 stripper

196 The total number of different occupations in the graphic arts industry is about

(1) 35
(2) 45
(3) 65
(4) 80

197 In the field of composition, there is the greatest need for

1 hand compositors
2 linotype operators
3 monotype operators
4 photo typesetters

Group Questions (198-212)

198 On the line at the left of each type of filter listed in parts a through e, write the number of the phrase, chosen from the list below, that gives one use of that type of filter. [5]

Uses

(1) Produces the proper brightness relationship for black and white film
(2) Used to restrict light passing through the lens
(3) Used to cut down glare
(4) Used to cut down haze
(5) Used with tungsten film outdoors
(6) Used with daylight film indoors
(7) Gives most dramatic contrast of all listed black and white filters

____ a polarizing filter
____ b neutral density filter
____ c red filter
____ d light yellow filter
____ e skylight filter

199 Several materials that are used in processing film are listed in parts a through e. On the line at the left of each material, write the number of the phrase, chosen from the list below, that best describes the function of that material. [5]

Functions

(1) Removes exposed silver salts
(2) Dissolves the unused silver halide
(3) Arrests the action of the developer
(4) Removes the excess fixer allowing a shorter wash cycle
(5) Neutralizes the wash water
(6) Improves absorption (a wetting agent)
(7) Changes the silver halide to metallic silver

____ a stop-bath
____ b fixer
____ c photo-flo
____ d hypo-clear
____ e developer

200 On the line at the left of each type of film listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that film [5]

Descriptions

(1) Color film that can be used indoors
(2) Film used primarily for copy work
(3) Film that can be developed in a darkroom with a red safelight
(4) Black and white film that is responsive to all colors
(5) High speed film that can be used at night

(6) Color film that can be used outdoors

_____ a panchromatic film
_____ b tungsten film
_____ c orthochromatic film
_____ d daylight film
_____ e infrared film

201 On the line at the left of each camera part function listed in parts a through e, write the number of the camera part, chosen from the list below, that performs that function. (A number may be used more than once.) [5]

Camera Parts

(1) Viewfinder
(2) Shutter
(3) Diaphragm
(4) Lens

___ a shows the picture that a camera will photograph
___ b regulates the amount of light passing through the lens
___ c regulates the time that light is allowed to enter a camera
___ d regulates the depth of field
___ e gathers and focuses rays of light

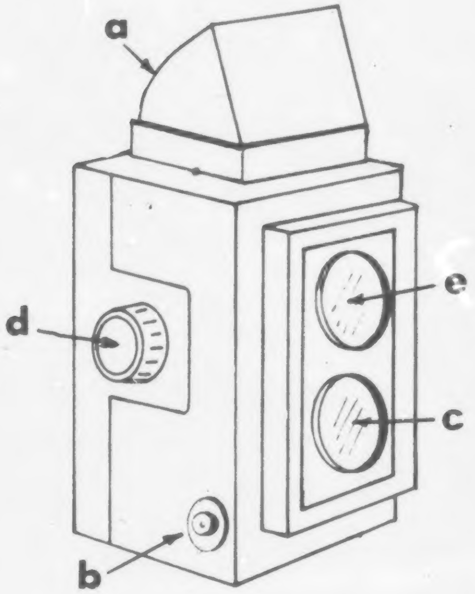
202 On the line at the left of each lens focal length listed in parts a through e, write the number of the type of lens, chosen from the list below, that would have that focal length. [5]

Types of Lenses

(1) Moderate wide angle lens for a 35 mm camera
(2) Fish-eye lens for a 35 mm camera
(3) Normal lens for a camera using 120 film
(4) Normal lens for a 4 inch by 5 inch camera
(5) Normal lens for a 35 mm camera
(6) Extreme telephoto lens for a 35 mm camera
(7) Zoom lens for a 35 mm camera

___ a 6 mm
___ b 35 mm
___ c 50 mm
___ d 90 mm
___ e 500 mm

203 A diagram of a basic reflex camera is shown below. On the line at the left of each of parts a through e, write the number of the camera part, chosen from the list below, that is indicated by that letter in the diagram. [5]



Camera Parts

(1) Film advance knob
(2) Ground glass viewing screen
(3) Lens
(4) Focus knob
(5) Viewing lens
(6) Shutter release
(7) Shutter

____ a
____ b
____ c
____ d
____ e

204 On the line at the left of each item of photographic equipment listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes how that item of equipment would be used. (A number may be used more than once.) [5]

Uses

(1) Used to provide light when taking a picture
(2) Used to obtain the appropriate f-stop setting
(3) Used to support a camera
(4) Used to obtain a clear sharp picture

___ a tripod
___ b strobe
___ c focusing ring
___ d diaphragm ring
___ e exposure meter

205 On the line at the left of each type of ink listed in parts a through e, write the number of the description, chosen from the list below, that best describes that ink. [5]

Descriptions

(1) Can be used on cloth
(2) Change color when water is applied
(3) Dry with a matte finish
(4) Are difficult to run (print)
(5) Used to reproduce illustrations
(6) Can be dissolved
(7) Permit light to pass through them

___ a indelible inks
___ b metallic inks
___ c process inks
___ d safety inks
___ e transparent inks

206 On the line at the left of each principle of display listed in parts a through e, write the number of the definition, chosen from the list below, that best describes that principle. [5]

Definition

(1) Words properly grouped
(2) Density of strength of a color
(3) Type and margins occupy an equal area of space
(4) Continuity in all the elements of printed design
(5) Exercise of common sense
(6) Provides emphasis and variation
(7) Gradation of tones

___ a fitness
___ b balance
___ c shape harmony
___ d tone harmony
___ e contrast harmony

207 On the line at the left of each product listed in parts a through e, write the number of the paper stock, chosen from the list below, that would be used to make that product. [5]

Paper Stock

(1) Onionskin
(2) English finish
(3) Super calendered
(4) Cover
(5) Index
(6) Bond
(7) Newsprint

___ a office forms
___ b magazines
___ c carbon copies
___ d books
___ e announcements

208 On the line at the left of each offset term listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that term. [5]

(1) Flow of ink
(2) Smudging of ink
(3) Spreading of ink
(4) Bleeding of ink
(5) Transparency of printed sheets
(6) Diluting of ink
(7) Failure of ink to adhere

_____ a crocking
_____ b cut
_____ c show through
_____ d smearing
_____ e stripping

209 On the line at the left of each type of press listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that type of press. [5]

Descriptions

(1) A small lithographic press
(2) A small letterpress press
(3) A silk screen press
(4) A cylinder press having type in a horizontal position
(5) A press that prints from a curved plate
(6) A press using roll feed
(7) A press used to print on round surfaces

_____ a web press
_____ b platen press
_____ c offset duplicator
_____ d flatbed press
_____ e rotary press

210 On the line at the left of each occupation listed in parts a through e, write the number of the job description, chosen from the list below, that best describes that occupation. [5]

Job Descriptions

(1) Retouches halftones
(2) Designs photoengravings
(3) Operates lithographic presses
(4) Operates flatbed presses
(5) Makes negatives on a process camera
(6) Exposes sensitized plates through negatives
(7) Makes layouts on paper, glass, or film

_____ a dot etcher
_____ b platemaker
_____ c offset pressman
_____ d stripper
_____ e cameraman

211 On the line at the left of each term in parts a through e, write the number of the phrase, chosen from the list below, that provides the best definition of that term. [5]

Definitions

(1) A pen and ink drawing
(2) A mechanical layout of the actual material to be printed
(3) An offset plate used on a printing press
(4) Material that is ready to be set up for printing
(5) Goldenrod paper and negatives that are ready for burning
(6) A pattern arrangement of the material to be printed
(7) A photograph ready for printing

_____ a illustration
_____ b dummy
_____ c copy
_____ d pasteup
_____ e flat

212 On the line at the left of each printing term listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that term. [5]

Descriptions

(1) Adjusting size of spacing between lines of type
(2) Adding space to exactly fill a line of type
(3) Fitting copy to a page
(4) Adjusting the paragraph size of copy
(5) Making lines on a pasteup
(6) Setting type from copy
(7) Making proper border size for copy

_____ a composing
_____ b copysetting
_____ c leading
_____ d justifying
_____ e ruling

Industrial Arts Examination Materials
GRAPHIC ARTS
Scoring Key

Multiple-Choice Questions

(1)	4	(26)	4	(51)	3	(76)	1
(2)	3	(27)	3	(52)	2	(77)	3
(3)	2	(28)	2	(53)	1	(78)	4
(4)	2	(29)	1	(54)	4	(79)	3
(5)	3	(30)	2	(55)	1	(80)	4
(6)	3	(31)	2	(56)	1	(81)	2
(7)	3	(32)	3	(57)	1	(82)	1
(8)	2	(33)	1	(58)	2	(83)	3
(9)	1	(34)	4	(59)	3	(84)	3
(10)	4	(35)	3	(60)	4	(85)	2
(11)	1	(36)	3	(61)	2	(86)	1
(12)	1	(37)	3	(62)	3	(87)	3
(13)	4	(38)	3	(63)	4	(88)	1
(14)	3	(39)	3	(64)	3	(89)	4
(15)	1	(40)	4	(65)	1	(90)	2
(16)	3	(41)	3	(66)	3	(91)	4
(17)	1	(42)	1	(67)	2	(92)	2
(18)	3	(43)	1	(68)	2	(93)	3
(19)	3	(44)	1	(69)	4	(94)	1
(20)	4	(45)	3	(70)	4	(95)	2
(21)	1	(46)	2	(71)	1	(96)	3
(22)	4	(47)	1	(72)	4	(97)	1
(23)	4	(48)	2	(73)	1	(98)	4
(24)	2	(49)	3	(74)	2	(99)	3
(25)	3	(50)	3	(75)	2	(100)	3

Industrial Arts Examination Materials
GRAPHIC ARTS (Con'd)
Scoring Key

Multiple Choice Questions

(101)	2	(126)	2	(151)	4	(176)	3
(102)	4	(127)	1	(152)	1	(177)	4
(103)	3	(128)	1	(153)	4	(178)	2
(104)	1	(129)	1	(154)	3	(179)	3
(105)	3	(130)	2	(155)	1	(180)	4
(106)	4	(131)	3	(156)	4	(181)	2
(107)	2	(132)	4	(157)	1	(182)	4
(108)	2	(133)	4	(158)	3	(183)	3
(109)	4	(134)	1	(159)	3	(184)	4
(110)	3	(135)	3	(160)	2	(185)	3
(111)	4	(136)	1	(161)	3	(186)	4
(112)	4	(137)	3	(162)	3	(187)	2
(113)	1	(138)	4	(163)	2	(188)	1
(114)	4	(139)	4	(164)	3	(189)	3
(115)	2	(140)	1	(165)	1	(190)	4
(116)	1	(141)	3	(166)	3	(191)	1
(117)	4	(142)	3	(167)	3	(192)	4
(118)	2	(143)	3	(168)	1	(193)	3
(119)	4	(144)	3	(169)	2	(194)	4
(120)	3	(145)	1	(170)	1	(195)	3
(121)	1	(146)	3	(171)	2	(196)	3
(122)	2	(147)	2	(172)	4	(197)	4
(123)	4	(148)	3	(173)	3		
(124)	3	(149)	4	(174)	2		
(125)	3	(150)	2	(175)	3		

Industrial Arts Examination Materials
GRAPHIC ARTS
Scoring Key

Group Questions

	a	b	c	d	e
(198)	3	2	7	1	4
(199)	3	2	6	4	7
(200)	4	1	3	6	5
(201)	1	3	2	3	4
(202)	2	1	5	3	6
(203)	2	6	3	1	5
(204)	3	1	4	2	2
(205)	1	4	5	2	7
(206)	5	1	4	2	6
(207)	2	3	1	4	6
(208)	2	6	5	3	7
(209)	6	2	1	4	5
(210)	1	6	3	7	5
(211)	1	6	4	2	5
(212)	6	3	1	2	5

Industrial Arts Examination Materials

METALS

Directions (1-161): On your answer paper, write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Bench Metals

Unit A Sheet and Band (1-18)

1 Which tool is used for scratching lines on sheet metal?

1 pin punch
2 prick punch
3 awl
4 center punch

2 Which layout tool is used to swing a large arc?

1 scriber
2 trammel
3 caliper
4 surface gage

3 The tools used as anvils by a sheet metalworker are called

1 punches
2 stakes
3 plates
4 hammers

4 Which type of tin snips should be used when cutting inside circles and doing circular cutting in tight places?

1 aviation
2 hawk-billed
3 straight
4 circular

5 Which machine is used for shaping cylinders out of sheet metal?

1 bar folder
2 box and pan brake
3 slip-roll forming machine
4 turning or rotary machine

6 Which machine is used for shaping a wired edge on sheet metal?

1 bar folder
2 box and pan brake
3 slip-roll forming machine
4 turning or rotary machine

7 Which machine is most commonly used for bending the edges of flat sheet metal?

1 a bar folder
2 a box and pan brake
3 a slip-roll forming machine
4 a turning or rotary machine

8 Which machine can be used to bend sheet metal at any distance from the edge of the sheet?

1 bar folder
2 box and pan brake
3 slip-roll forming machine
4 turning or rotary machine

9 Gage numbers designate the standard wire diameters and thicknesses of

1 plate steel
2 band iron
3 sheet metal
4 rod stock

10 Which gage is used to measure the thickness of all ferrous metals?

1 American Standard
2 Brown & Sharpe
3 United States Standard
4 Birmingham

11 In schools, most of the machines designed to handle sheet metal have a gage capacity of

(1) 12
(2) 16
(3) 26
(4) 30

12 The process of cutting metal from the inside of a design with a jeweler's saw is called

1 doming
2 slotting
3 piercing
4 chasing

13 A full-size drawing used as a guide for a sheet metal layout is often called a

1 development
2 projection
3 pattern
4 mold

14 The device used as a guide for making several pieces exactly alike is called a

1 template
2 layout
3 drawing
4 sketch

15 Sheet metal is usually manufactured in thicknesses of

(1) less than $\frac{1}{4}$ in

(2) between $\frac{1}{4}$ in and $\frac{1}{2}$ in

(3) between $\frac{1}{2}$ in and $\frac{3}{4}$ in

(4) more than $\frac{3}{4}$ in

16 Of the four seams for joining sheet metal listed below, which is most commonly used?

1 butt joint
2 lap
3 folded
4 grooved

17 Of the four methods of pattern development listed below, which method is used for pieces which have a different shape at each end?

1 angular
2 triangulation
3 cylindrical
4 conical

18 Which type of shears is used for cutting pieces of sheet metal for the bottoms or covers of round cans?

1 level	3 squaring
2 slitting	4 ring and circle

Unit B Welding (19-30)

19 A brazing flux is used to

1 clean metal and aid the brazing flow
2 retard the rapid cooling of metal
3 create a hotter flame at the brazing point
4 keep the torch tip clean

20 Solder is made of

1 lead and tin	3 copper and zinc
2 tin and copper	4 zinc and lead

21 Spot welding is an example of

1 Thermit welding	3 arc welding
2 gas welding	4 resistance welding

22 In which type of welding is an electric current passed through pieces of metal that are held together by pressure?

1 resistance spot welding
2 forge welding
3 arc welding
4 gas welding

23 What is the most common form of gas welding?

1 air-acetylene	3 hydroacetylene
2 oxyacetylene	4 oxyhydrogen

24 Welding by heating and hammering pieces of metal together is called

1 resistance spot welding
2 forge welding
3 arc welding
4 gas welding

25 A stronger weld is produced by shielded arc welding than by gas welding because the

1 weld penetrates deeper into the metals being welded
2 weld covers more of the surface being welded
3 weld cools more slowly and does not become brittle
4 welded area flows more easily

26 When heat is used to melt and flow metal together, the weld formed is called a

1 solder weld
2 braze weld
3 fusion weld
4 forge weld

27 What must be the kindling temperature of metals that are cut with an oxyacetylene torch?

(1) 1,600° F
(2) 3,300° F
(3) 4,900° F
(4) 6,300° F

28 What is the maximum working pressure that should be used from an acetylene tank when cutting metals by hand?

(1) 5 p.s.i.
(2) 10 p.s.i.
(3) 15 p.s.i.
(4) 20 p.s.i.

29 What gas pressure should be used with a number six tip?

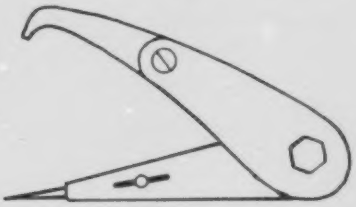
(1) 6 p.s.i.
(2) 8 p.s.i.
(3) 3 p.s.i.
(4) 10 p.s.i.

30 When the cutting lever is pushed on the oxyacetylene cutting torch, what comes out of the center cutting hole on the torch tip?

1 pure acetylene
2 pure oxygen
3 an oxygen-acetylene mixture
4 air.

Unit C Measurement (31-41)

31 Which measurement tool is shown below?



1 an inside-outside caliper
2 a compass
3 a hermaphrodite caliper
4 a stalagmite divider

32 Which gage is used to find the number of threads per inch?

1 thread plug gage
2 screw pitch gage
3 stubs' gage
4 United States Standard gage

33 A feeler gage is also called a

1 pitch gage
2 depth gage
3 radius gage
4 thickness gage

34 A vernier micrometer can be read to the nearest

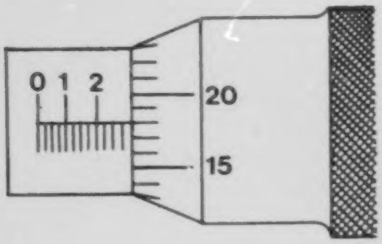
(1) .00001 in
(2) .0001 in
(3) .001 in
(4) .01 in

35 A micrometer measures in which part of an inch?

1 millionths of an inch
2 thousandths of an inch
3 hundredths of an inch
4 tenths of an inch

36 Which micrometer reading is shown below?

(1) .243 in
(2) .268 in
(3) .293 in
(4) .318 in



37 The decimal equivalent of $\frac{15}{16}$ is

(1) .8750
(2) .9375
(3) .9531
(4) $1.066\overline{6}$

38 When measuring an object with a micrometer, between which two parts of the micrometer should the object be placed?

1 frame and barrel
2 anvil and spindle
3 sleeve and thimble
4 ratchet and lock nut

39 In which country was the metric system first used?

1 England
2 Russia
3 France
4 Italy

40 Which prefix in the metric system means a thousandth?

1 milli
2 centi
3 deci
4 kilo

41 A metric micrometer would read in

1 millimeters
2 centimeters
3 decimeters
4 kilometers

Unit D Bench Processes (42-68)

42 For which type of screw is the length of the head included in the length measurement printed on the box containing the screws?

1 round head screws
2 flat head screws
3 fillister head screws
4 hexagon head screws

43 Ball-peen hammers are classified according to

1 length
2 width
3 weight
4 shape

44 Which one of the following abrasives is synthetic?

1 flint
2 silicon carbide
3 garnet
4 crocus

45 Which is the finest abrasive grade rating?

(1) No. 20
(2) No. 180
(3) No. 240
(4) No. 400

46 Which type of file should be used when working with nonferrous metals?

1 rough cut
2 curved tooth
3 smooth
4 bastard

47 The handle of a file is attached to the file's

1 face
2 heel
3 edge
4 tang

48 When cutting a 2-inch thick piece of aluminum, how many teeth per inch should the hacksaw blade have?

(1) 14
(2) 18
(3) 24
(4) 32

49 A hacksaw blade with 32 teeth per inch and a wave set could be used to cut

1 water pipe
2 an I-beam
3 thin wall tubing
4 angle iron

50 Which is the most common cause of power hacksaw breakage?

1 impurities in the material being cut
2 use of the wrong blade size
3 too little coolant being pumped onto the work
4 poorly clamped work

51 When the number 12-24 is stamped on the shank of a tap, the 12 refers to the

1 gage of the drill
2 threads per inch
3 length of the drill
4 size of the clearance drill required

52 When using a hand drill to drill a hole in metal, what is the size hole above which a pilot hole should be used?

(1) $\frac{1}{4}$ in.
(2) $\frac{3}{8}$ in.
(3) $\frac{1}{2}$ in.
(4) $\frac{3}{4}$ in.

53 The cutting lips of a drill used for mild steel should form an angle of

(1) 59°
(2) 69°
(3) 79°
(4) 89°

54 What size drill bit should be used to drill a .375-inch diameter hole?

(1) $\frac{1}{4}$ in. (3) $\frac{3}{8}$ in.

(2) $\frac{9}{64}$ in. (4) $\frac{7}{16}$ in.

55 A hand drill should not be used when

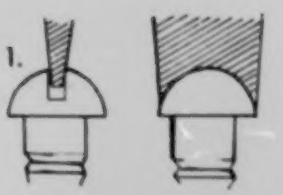
1 drilling in hard-to-reach places
2 drilling through thin material
3 an accurate hole diameter is required
4 an accurate hole angle is required

56 A sheet metal screw is a type of

1 machine screw 3 self-tapping screw
2 thumb screw 4 cap screw

57 Which screwdriver head fits the head slot properly?

1.



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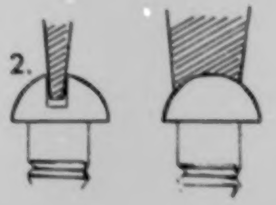

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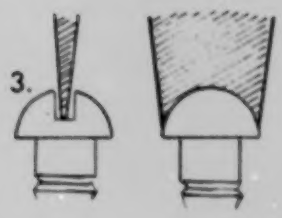
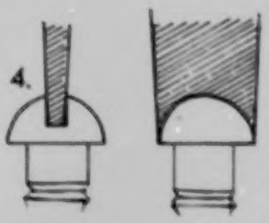


4.



58 Which tool is used to cut internal threads?

1 tap
2 threading tool bit
3 die
4 reamer

59 Which tool is used to cut external threads?

1 tap
2 boring bar
3 die
4 reamer

60 What is the main advantage of the blind rivet over other types of rivets?

1 It can be inserted and set from the same side.
2 It is less expensive.
3 It has a greater holding power.
4 It has a better finished appearance.

61 Which one of the following is not a permanent fastener?

1 rivet
2 solder
3 screw
4 weld

62 A screw plate contains a complete set of

1 taper, plug, and bottoming taps
2 tap and clearance drills
3 taps and dies
4 number and fractional drills

63 Which clamping device should be used to hold round stock most accurately?

(1) C-clamp
(2) V-blocks
(3) spring clamp
(4) vise

64 A twist in a piece of band iron is formed by using

1 an O-radius bender
2 a monkey wrench
3 bending forks
4 metal forms

65 The process of applying fine grains of glass to metal is called

1 etching
2 glazing
3 enameling
4 pickling

66 The process used to form feet on the underside of a sheet metal object is called

1 overlaying
2 planishing
3 fluting
4 doming

67 The process of filing the corner of a piece of metal while it is held over the edge of a bench is called

1 drawing
2 precisioning
3 straightening
4 dressing

68 The method of cutting flat metal against vise jaws with a cold chisel is called

1 bending
2 upsetting
3 shearing
4 forming

Unit E Raw Materials (69-77)

69 The waste material resulting from an iron purifying furnace is called

1 coke
2 slag
3 pig
4 shell

70 Most of the iron ore mined in the United States comes from

1 the west coast
2 the New England area
3 the Great Lakes area
4 Pennsylvania and West Virginia

71 The largest steel-producing city in the United States is

1 Gary, Indiana
2 Pittsburg, Pennsylvania
3 Birmingham, Alabama
4 Buffalo, New York

72 Which three states have the greatest amount of iron ore deposits?

1 Arkansas, Oregon, California
2 Alabama, Maine, Texas
3 Washington, New York, Pennsylvania
4 Michigan, Minnesota, Alabama

73 By which method is most steel manufactured in the United States?

1 open-hearth
2 basic oxygen process
3 electric arc
4 Bessemer converter

74 Bauxite is used to make

1 steel
2 brass
3 copper
4 aluminum

75 Which ingredient makes steel stiff, strong, hard, and brittle?

1 iron
2 carbon
3 limestone
4 chromium

76 Which element must a ferrous metal contain?

1 iron
2 copper
3 carbon
4 lead

77 Galvanized steel has a coating of

1 zinc
2 aluminum
3 chromium
4 brass

Unit F Industry and Careers (78-81)

78 A person who works in the science of separating metals from rocks is called a

1 patternmaker	3 marketing manager
2 metallurgist	4 coppersmith

79 Which one of the following best defines a journeyman?

1 a worker who has met minimum qualifications
2 a beginning apprentice
3 a master mechanic in 2 or more areas
4 a worker who has not started apprenticeship

80 Which one of the following best defines a machine tool operator?

1 unskilled
2 semi-skilled
3 technician
4 engineer

81 Which one of the following best defines a toolroom foreman?

1 a journeyman
2 an engineer
3 a master machinist
4 an apprentice technician

Metals

Part II - Production Metals

Unit A Industrial Requirements (82-90)

82 What is the final function of any industrial organization?

1 distribution   3 planning
2 manufacturing   4 engineering

83 What man is given credit for first using the process of mass production with interchangeable parts?

1 Henry Ford   3 James Watt
2 Gottlieb Daimler   4 Eli Whitney

84 Which group is responsible for establishing standards and inspecting manufactured goods?

1 production control   3 industrial control
2 quality control   4 power control

85 The industrial organization that transforms raw materials into usable goods or products is

1 production tooling   3 product design
2 operation analysis   4 manufacturing

86 The responsibility for producing new products, materials, and processes depends upon that part of industry known as

1 prodution planning   3 product design
2 manufacturing   4 marketing

87 The department in industry involved with the design and making of the jigs and fixtures used to mass-produce a product is

1 product design   3 production tooling
2 operation analysis   4 quality control

88 The phrase tooling up means providing the proper machines, equipment, and tools to produce a

1 prototype
2 scale model
3 mock-up
4 specified product

89 The most important task of production control is

1 appraisal activities
2 quality coordination
3 routing and scheduling
4 increasing shop morale

90 A schedule that assures the proper flow of materials through the production line is called a

1 routing sheet
2 Gantt chart
3 flow chart
4 layout chart

Unit B Machines and Equipment (91-110)

91 Which tool is used to remove the live center from a headstock?

1 knockout bar
2 center puller
3 center wrench
4 pry-bar

92 The purpose of drilling a pilot hole prior to drilling a large hole is to

1 reduce the friction produced by the larger bit
2 provide a guide for the larger drill bit
3 provide a hole for cutting oil drainage
4 provide a hole for removing chips

93 Which accessory is needed for turning between centers on a lathe?

1 a 3-jaw chuck
2 a collet assembly
3 a headstock spindle
4 a faceplate

94 Which type of file should be used for filing on a lathe?

1 pillar
2 warding
3 knife
4 mill

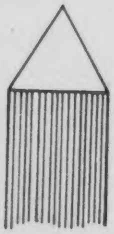
95 Squaring the end of a piece of work for the lathe is called

1 knurling
2 facing
3 boring
4 turning

96 The lathe cutting tool and its rest are attached to the lathe's

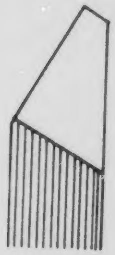
1 bed
2 headstock
3 carriage
4 ways

97 For which operation is the lathe tool bit shown below designed?



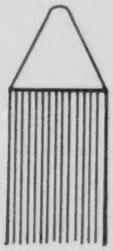
1 turning
2 facing
3 threading
4 cut-off

98 For which operation is the lathe tool bit shown below designed?



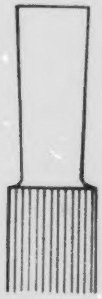
1 turning
2 facing
3 threading
4 cut-off

99 For which operation is the lathe tool bit shown below designed?



1 turning
2 facing
3 threading
4 cut-off

100 For which operation is the lathe tool bit shown below designed?



1 turning
2 facing
3 threading
4 cut-off

101 Which lathe tool is used to cut a rough, diamond-shaped pattern on handle grips?

1 knurling tool
2 threading tool
3 facing tool
4 turning tool

102 On which machine would a keyway be cut?

1 lathe
2 band saw
3 milling machine
4 grinder

103 Which machine would be used to cut keyways, T-slots, and dovetails?

1 milling machine
2 grinder
3 drill press
4 lathe

104 The safest method of removing metal chips from a cutting machine is to use

1 an air hose
2 a broom
3 a rag
4 a brush

105 On a grinder, the gap between the tool rest and the wheel should be

(1) $\frac{1}{16}$ in to $\frac{1}{8}$ in
(2) $\frac{1}{8}$ in to $\frac{1}{4}$ in
(3) $\frac{1}{4}$ in to $\frac{3}{8}$ in
(4) $\frac{3}{8}$ in to $\frac{1}{2}$ in

106 Which one of the following is an attachment used on a machine to perform multiple operations?

1 tracer
2 profiler
3 radial
4 turret

107 Shaping internal and external parts by pushing or pulling a tapered tool is called

1 sawing
2 broaching
3 slotting
4 grinding

108 The main reason for not using soft, non-ferrous metals on the grinder is that they

1 have a low melting point
2 tend to clog the face of the wheel
3 tend to catch on fire easily
4 wear down the wheel too quickly

109 Which test is most commonly used to detect a cracked grinding wheel?

1 submerging the wheel in water and looking for bubbles
2 striding the wheel lightly with a mallet and listening for a ring
3 dropping the wheel on the floor and looking for chips
4 locking the wheel in a vise and bending the wheel back and forth

110 A drill press should always be used when

1 an accurate hole angle is required
2 drilling in hard-to-reach places
3 the hole center is more than 18 inches from the edge of the work
4 drilling overhead

Unit C Forming (111-119)

111 The process of changing the shape of metal in one direction is called

1 blanking
2 bending
3 piercing
4 notching

112 The process of forming metal by using heat and pressure is called

1 machining
2 casting
3 forging
4 folding

113 The process used to give objects a certain shape without adding or removing any materials is called

1 cutting
2 fastening
3 forming
4 punching

114 Which forming process is used to shape large ingots of rough metal?

1 extruding
2 drawing
3 rolling
4 pressing

115 Which one of the following is an example of a metal-forming operation?

1 milling
2 turning
3 drawing
4 abrading

116 Which devices are used to shape a metal during the stamping process?

1 jigs and fixtures
2 punches and dies
taps and dies
4 tools and dies

117 Cold forming sheet metal on a lathe is called

1 spinning
2 stamping
3 shaping
4 turning

118 Which type of center is used when spinning a metal disc on a lathe?

1 soft
2 hard
3 live
4 dead

119 Which manufacturing method will produce the highest quality tools?

1 casting
2 stamping
3 drop forging
4 extruding

Unit D Casting (120-136)

120 A pyrometer is used to measure the

1 amount of moisture in sand
2 temperature of molten metal
3 weight of a finished casting
4 amount of gas escaping from a furnace

121 Which instrument is used to measure the temperature of molten metal?

1 hydrometer
2 pyrometer
3 barometer
4 fadometer

122 What is the most widely used method of casting?

1 green sand casting
2 dry sand casting
3 plaster mold casting
4 die casting

123 Which type of casting uses the process of filling a rotating mold with molten metal?

1 die
2 plaster mold
3 shell mold
4 centrifugal

124 Which type of casting uses metal molds?

1 shell
2 die
3 sand
4 plaster

125 Which material is used as the pattern for working with lost form casting?

1 plaster
2 dry sand
3 wax
4 rubber

126 The large container into which molten metal is poured is called a

1 crucible
2 pouring cup
3 pouring tank
4 ladle

127 The wooden or metal box frame that holds the sand in a cast is called a

1 cope
2 drag
3 flask
4 mold

128 What are the two halves of a foundry flask?

1 the slick and spoon
2 the cope and drag
3 the sprue and riser
4 the butt and peen

129 When molten metal is poured into a mold, the metal enters through the

1 core
2 vent
3 sprue
4 riser

130 At which part of the mold does flash occur?

1 riser
2 gate
3 core
4 parting line

131 Which foundry tool is used to smooth and repair the sand around a mold?

1 slick and spoon
2 cope and drag
3 sprue and riser
4 butt and peen

132 In which type of mold is the original mold melted away?

1 plaster
2 investment
3 shell
4 dry-sand

133 What is the name of the taper on a pattern that makes it easy to lift the object from the form?

1 dish
2 draft
3 chamfer
4 fillet

134 Except for being smaller, the cupola melting furnace looks most like the

1 direct arc furnace
2 blast furnace
3 basic oxygen furnace
4 open hearth furnace

135 The pouring temperature for aluminum is between

(1) 448° and 450° F
(2) 1218° and 1220° F
(3) 1675° and 1700° F
(4) 2700° and 2750° F

136 The temperature at which a metal becomes a liquid is known as the metal's

1 critical point
2 pouring point
3 melting point
4 boiling point

Unit E Metallurgy (137-146)

137 The process of coating iron or steel with zinc to prevent rusting is called

1 anodizing
2 plating
3 pickling
4 galvanizing

138 The heat-treatment process designed to increase the toughness of steel is called

1 annealing
2 tempering
3 hardening
4 normalizing

139 The heat-treatment process designed to increase the strength of the thin surface layer of steel is called

1 annealing
2 tempering
3 quenching
4 casehardening

140 The heat-treatment process designed to completely soften steel is called

1 annealing
2 tempering
3 hardening
4 quenching

141 Which property of a metal refers to the metal's resistance to breaking, bending, or cracking?

1 toughness
2 malleability
3 elasticity
4 ductility

142 Which metal is used in missiles, electronic tubes, industrial furnaces, and nuclear projects?

1 titanium
2 molybdenum
3 beryllium
4 vanadium

143 Which metal burns easily and produces an intense white light as it burns?

1 aluminum
2 silver
3 tin
4 magnesium

144 Which alloy metal contains copper and tin?

1 brass
2 solder
3 bronze
4 nickel silver

145 Bronze is made of

1 lead and tin
2 tin and copper
3 copper and zinc
4 zinc and lead

146 Brass is made of

1 lead and tin
2 tin and copper
3 copper and zinc
4 zinc and lead

Unit F Industrial Organization (147-161)

147 Which occupation is being described below?

- must serve a 3-to 4-year apprenticeship, must know basic geometry; must be able to read blueprints; must know how to rivet, solder, and work on vent duct work, lockers, airplane and auto bodies, metal roofs and ceilings.

1 welder
2 steam fitter
3 machinist
4 sheet metal worker

148 Which occupation is being described below?

- must have a college education with emphasis on chemistry; must know laboratory processes, geology, and physics; must be familiar with engineering.

1 inspector
2 boilermaker
3 technician
4 metallurgist

149 Which occupation is being described below?

- must serve a 4-year apprenticeship; must be able to read blueprints; must have a high school diploma; job will involve hot, dirty, dusty, heavy work and danger from hot metal and sparks.

1 draftsman
2 foundry molder
3 welder
4 lathe operator

150 In which industrial job category would a tool and die worker be placed?

1 semiskilled
2 skilled
3 technical
4 professional

151 In which industrial job category would a programmer of a numerically controlled machine be placed?

1 semiskilled
2 skilled
3 technical
4 professional

152 In which industrial job category would an assembly-line riveter be placed?

1 semiskilled
2 skilled
3 technical
4 professional

153 In which industrial job category would a high school industrial arts teacher be placed?

1 semiskilled
2 skilled
3 technical
4 professional

154 Which department is responsible for inspecting a product for defects?

1 engineering
2 machinists
3 quality control
4 research

155 A person who learns a trade from a master worker while working at that trade is called

1 a journeyman
2 an apprentice
3 a technician
4 a mechanic

156 Another name for the investors or owners of a corporation is the

1 directors
2 managers
3 supervisors
4 stockholders

157 The letters R & D in an industrial organization usually refer to

1 routing and dispatching
2 replacement and distribution
3 retraining and discipline
4 research and development

158 Which term refers to both automation and computerization?

1 specialization
2 cybernation
3 functionalization
4 mechanization

159 What is the main advantage of mass production over other production methods?

1 better craftsmanship
2 reduced production time
3 greater job security
4 increased worker satisfaction

160 At present, the largest steel producing company in the United States is

1 Bethlehem Steel
2 Jones & Laughlin
3 United States Steel
4 Kaiser Steel

161 Which organized labor union represents the most metalworkers?

1 Communication Workers of America
2 United Auto Workers
3 International Brotherhood of Electrical Workers
4 Teamsters Union

Group Questions (162-176)

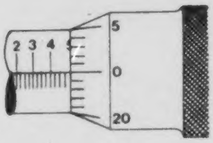
162 On the line at the left of each metal test listed in parts a through e, write the number of the description, chosen from the list below, that best describes how that test is performed. [5]

Descriptions

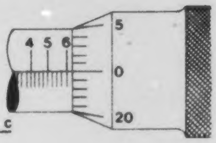
(1) The sample is pulled until it breaks.
(2) The sample is hit with a sharp blow by a pendulum.
(3) The sample is forced together.
(4) The depth of penetration of an object into the sample is measured.
(5) An object is bounced on the surface of the sample.
(6) A load is applied vertically to the sample.
(7) One end of the sample is moved up and down.

___ a Tensile strength
___ b Compression strength
___ c Shear strength
___ d Impact strength
___ e Fatigue strength

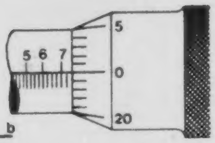
163 On the line at the left of each micrometer setting shown in parts a through e, write the number of the correct common fraction, chosen from the list below, which corresponds to that setting. [5]



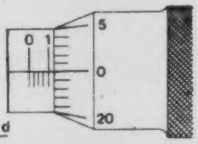
___ a



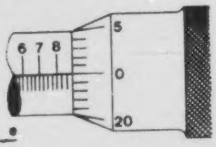
___ c



___ b



___ d



___ e

Fractions

(1) $\frac{1}{8}$
(2) $\frac{1}{4}$
(3) $\frac{5}{16}$
(4) $\frac{3}{8}$
(5) $\frac{1}{2}$
(6) $\frac{5}{8}$
(7) $\frac{3}{4}$
(8) $\frac{7}{8}$

164 A diagram of a welding outfit is shown below. On the line at the left of each of parts a through e, write the number of the function, chosen from the list below, that is performed by the part indicated by that letter in the diagram. [5]

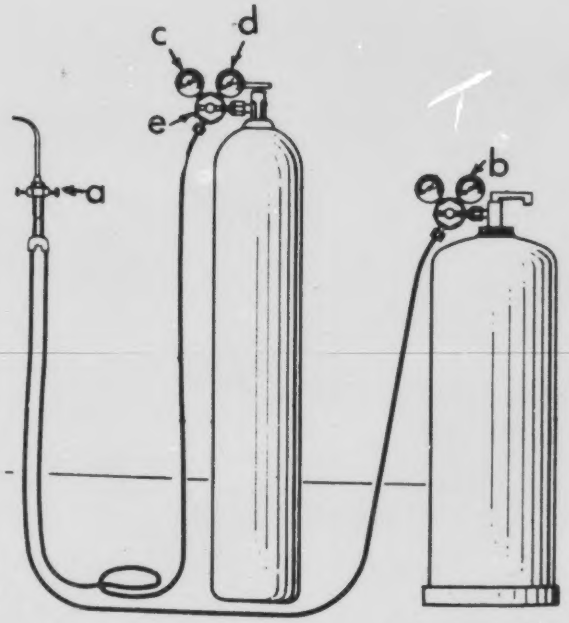
____ a

____ b

____ c

____ d

____ e



Functions

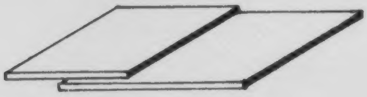
(1) Tells the pressure in the oxygen tank
(2) Used to adjust the amount of acetylene in the flame
(3) Used to adjust the oxygen working pressure
(4) Tells the acetylene working pressure
(5) Used to adjust the amount of oxygen in the flame
(6) Used to adjust the acetylene working pressure
(7) Tells the pressure in the acetylene tank
(8) Tells the oxygen working pressure

165 On the line at the left of each type of seam shown in parts a through e, write the number of the name, chosen from the list below, of that type of seam. [5]

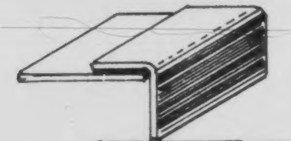
Names of Seams

(1) Single bottom seam
(2) Grooved seam
(3) Lap seam
(4) Flat lock seam
(5) Standing seam
(6) Outside corner lap seam
(7) Countersunk lap seam

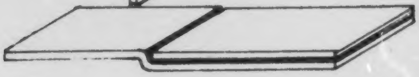
a



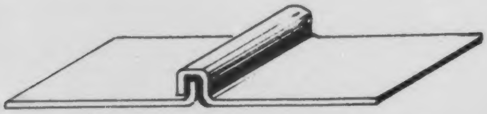
b



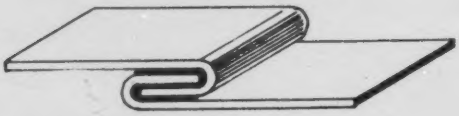
c



d



e



____ a

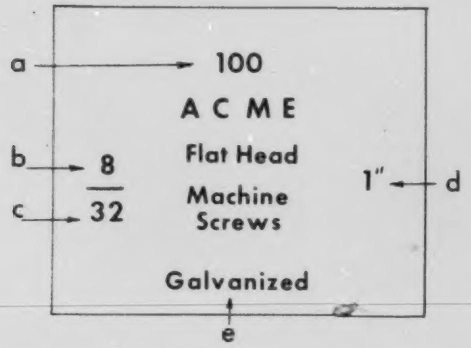
____ b

____ c

____ d

____ e

166 The label from a box of screws is shown in the diagram below. On the line at the left of each of parts a through e, write the number of the type of information, chosen from the list below, that is indicated by that letter in the diagram. [5]

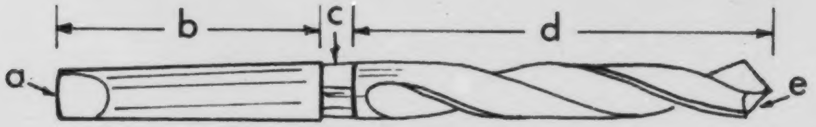

a
100
A C M E
b
8
32
c
Flat Head
Machine
Screws
1"
d
Galvanized
e

Type of Information

(1) Brand name
(2) Threads per inch
(3) Diameter
(4) Quantity
(5) Head shape
(6) Length
(7) Type of hardware
(8) Finish

______ a
______ b
______ c
______ d
______ e

167 A diagram of a twist drill is shown below. For each of parts a through e in the diagram below, write in the space provided the number of the name, chosen from the list below, which applies to that part. [5]



Names of Parts

(1) Neck
(2) Web
(3) Lip
(4) Heel
(5) Body
(6) Tang
(7) Shank
(8) Margin

_______ a
_______ b
_______ c
_______ d
_______ e

168 On the line at the left of each type of measurement listed in parts a through e, write the number of the metric unit, chosen from the list below, that would be used for that type of measurement. [5]

Metric Units

(1) Fahrenheit
(2) Liters
(3) Square miles
(4) Kilometers
(5) Megagrams
(6) Celsius
(7) Ounces
(8) Square kilometers

___ a Length
___ b Area
___ c Weight (mass)
___ d Liquid volume
___ e Temperature

169 On the line at the left of each phrase listed in parts a through e, write the number of the property, chosen from the list below, that is defined by that phrase. [5]

Properites

(1) Weldability
(2) Hardness
(3) Toughness
(4) Fusibility
(5) Elasticity
(6) Malleability
(7) Brittleness
(8) Ductility

___ a Resistance to being dented
___ b Ability to be drawn or stretched
___ c Ability to be hammered, rolled, and bent without breaking
___ d Resistance to breaking, bending, and stretching
___ e Ability to return to shape after being bent or twisted

170 On the line at the left of each method of making steel listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes that method. [5]

Descriptions

(1) Uses pure oxygen instead of air
(2) Used to make special alloy steel
(3) Has preheat air stoves
(4) Quickest way to make steel
(5) Used for making high carbon steel
(6) Uses skip cars for loading
(7) Like a baker's oven

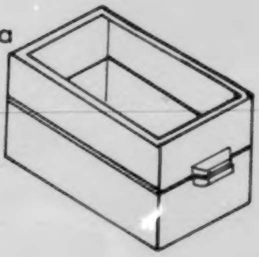
___ a Bessemer converter
___ b Open-hearth
___ c Crucible furnace
___ d Electric arc
___ e Basic oxygen process

171 On the line at the left of each foundry piece shown in parts a through e, write the number of the function, chosen from the list below, that is performed by that foundry piece. [5]

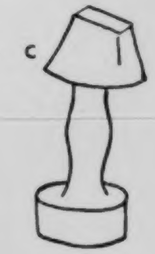
Functions

(1) Sifts lumps from the sand
(2) Forms the shape to be cast
(3) Holds sand for casting
(4) Makes vent holes
(5) Blows the excess sand away
(6) Moistens the sand
(7) Rams sand around the pattern
(8) Smooths sand around the pattern

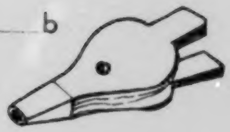
______ a



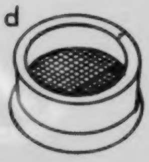
______ c



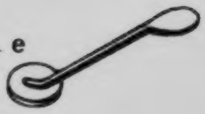
______ b



______ d



______ e

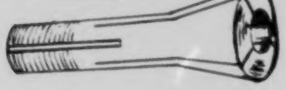


172 On the line at the left of each holding device shown in parts a through e, write the number of the name, chosen from the list below, of that holding device. [5]

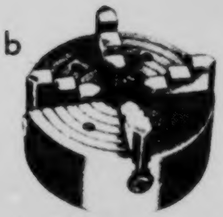
Names of Holding Devices

(1) Clamp-type lathe dog
(2) Jacobs chuck
(3) Collet
(4) Bent tail lathe dog
(5) Cone chuck
(6) Wood chuck
(7) 3-jaw universal chuck
(8) 4-jaw independent chuck

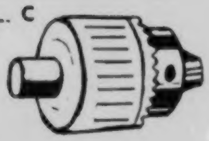
____ a



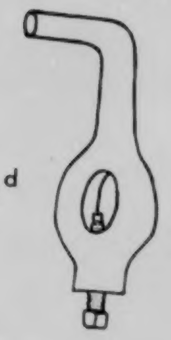
____ b



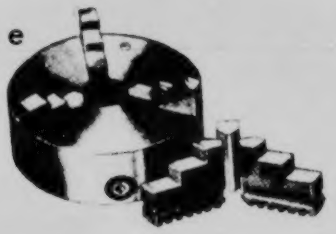
____ c



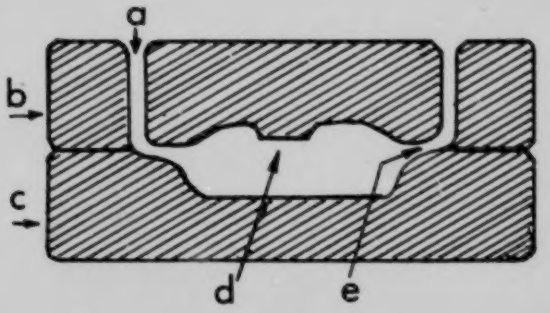
____ d



____ e



173 A casting mold is shown in the diagram below. On the line at the left of each of parts a through e, write the number of the mold part, chosen from the list below, that is indicated by that letter in the diagram. [5]



Mold Parts

(1) Sprue
(2) Parting line
(3) Pattern
(4) Vent hole
(5) Drag
(6) Gate
(7) Cope
(8) Sand

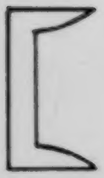
____ a
____ b
____ c
____ d
____ e

174 On the line at the left of each stock shape shown in parts a through e, write the number of the name, chosen from the list below, that correctly identifies that stock shape. [5]

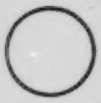
Names

(1) H-beam
(2) Angle
(3) Channel
(4) I-beam
(5) Round
(6) Octagon
(7) Square
(8) Hexagon

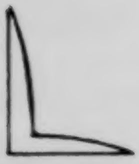
___ a



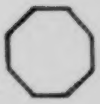
___ c



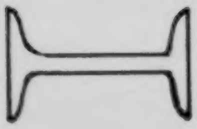
___ b



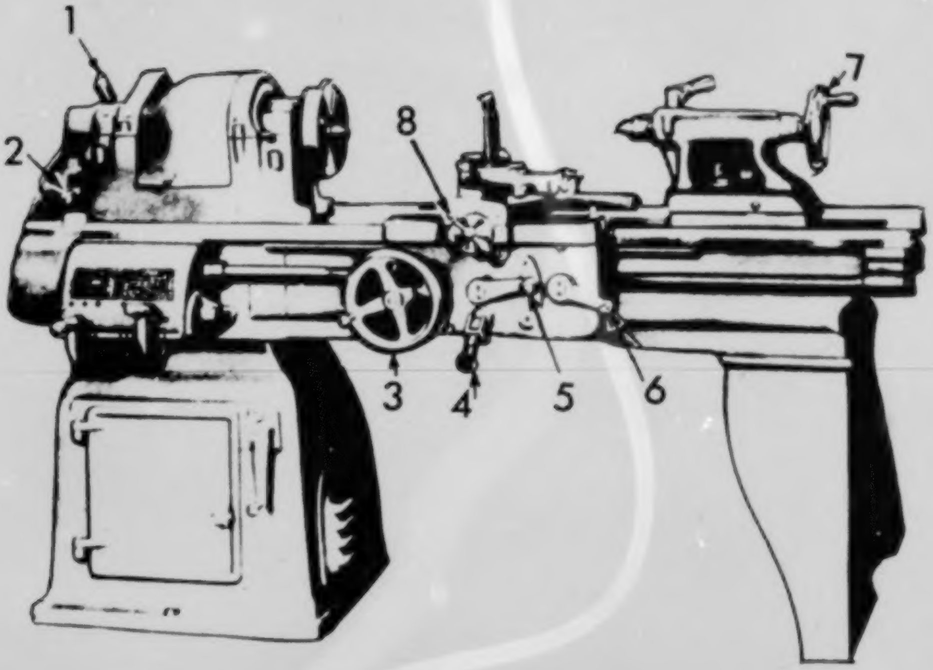
___ d



___ e



175 On the line at the left of each function listed in parts a through e, write the number of the lathe part, chosen from those indicated on the diagram below, that would be used to perform that function. [5]



_____ a Used to move the carriage back and forth manually

_____ b Used to obtain power for either longitudinal feed or cross feed

_____ c Used to reverse the movement of the lead screw

_____ d Used to move a hollow spindle in or out of the tailstock

_____ e Used to move the cross slide across the work manually

176 On the line at the left of each type of metal cutting listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes one way in which that type of metal cutting could be used. [5]

Uses

(1) To produce cylindrical shapes by moving the work against a stationary cutter
(2) To thread cylindrical surfaces of an existing hole with a tap
(3) To produce a smooth finish by moving the work against a rotating abrasive wheel
(4) To make a groove by moving the work against a revolving cutter
(5) To cut stock to size and shape with a reciprocating tool
(6) To make a goove on a shaft by moving a tool against the fixed work
(7) To produce cylindrical holes by using a rotating cutting tool

___ a Milling
___ b Broaching
___ c Drilling
___ d Turning
___ e Grinding

Industrial Arts Examination Materials

METALS

Scoring Key

Multiple-Choice Questions

(1)	3	(26)	3	(51)	1	(76)	1
(2)	2	(27)	1	(52)	2	(77)	1
(3)	2	(28)	3	(53)	1	(78)	2
(4)	2	(29)	1	(54)	3	(79)	1
(5)	3	(30)	2	(55)	4	(80)	2
(6)	4	(31)	3	(56)	3	(81)	3
(7)	1	(32)	2	(57)	4	(82)	1
(8)	2	(33)	4	(58)	1	(83)	4
(9)	3	(34)	2	(59)	3	(84)	2
(10)	3	(35)	2	(60)	1	(85)	4
(11)	3	(36)	3	(61)	3	(86)	3
(12)	3	(37)	2	(62)	3	(87)	3
(13)	3	(38)	2	(63)	2	(88)	4
(14)	1	(39)	3	(64)	2	(89)	3
(15)	1	(40)	1	(65)	3	(90)	3
(16)	2	(41)	1	(66)	4	(91)	1
(17)	2	(42)	2	(67)	4	(92)	2
(18)	4	(43)	3	(68)	3	(93)	4
(19)	1	(44)	2	(69)	2	(94)	4
(20)	1	(45)	4	(70)	3	(95)	2
(21)	4	(46)	2	(71)	1	(96)	3
(22)	1	(47)	4	(72)	4	(97)	3
(23)	2	(48)	1	(73)	2	(98)	2
(24)	2	(49)	3	(74)	4	(99)	1
(25)	3	(50)	4	(75)	2	(100)	4

Industrial Arts Examination Materials
METALS (Con'd)
Scoring Key

Multiple-Choice Questions

(101)	1	(126)	4	(151)	3
(102)	3	(127)	3	(152)	1
(103)	1	(128)	2	(153)	4
(104)	4	(129)	3	(154)	3
(105)	1	(130)	4	(155)	2
(106)	4	(131)	1	(156)	4
(107)	2	(132)	2	(157)	4
(108)	2	(133)	2	(158)	2
(109)	2	(134)	2	(159)	2
(110)	1	(135)	2	(160)	3
(111)	2	(136)	3	(161)	2
(112)	3	(137)	4		
(113)	3	(138)	2		
(114)	3	(139)	4		
(115)	3	(140)	1		
(116)	2	(141)	1		
(117)	1	(142)	2		
(118)	3	(143)	4		
(119)	3	(144)	3		
(120)	2	(145)	2		
(121)	2	(146)	3		
(122)	1	(147)	4		
(123)	4	(148)	4		
(124)	2	(149)	2		
(125)	3	(150)	2		

Industrial Arts Examination Materials

METALS

Scoring Key

Group Questions

(162)	a	1
	b	3
	c	6
	d	2
	e	7
(163)	a	5
	b	7
	c	6
	d	1
	e	8
(164)	a	5
	b	7
	c	8
	d	1
	e	3
(165)	a	3
	b	6
	c	7
	d	5
	e	4
(166)	a	4
	b	3
	c	2
	d	6
	e	8
(167)	a	6
	b	7
	c	1
	d	5
	e	3
(168)	a	4
	b	8
	c	5
	d	2
	e	6
(169)	a	2
	b	8
	c	6
	d	3
	e	5
(170)	a	4
	b	7
	c	5
	d	2
	e	1
(171)	a	3
	b	5
	c	7
	d	1
	e	8
(172)	a	3
	b	8
	c	2
	d	4
	e	7
(173)	a	1
	b	7
	c	5
	d	3
	e	6
(174)	a	3
	b	2
	c	5
	d	6
	e	4
(175)	a	3
	b	5
	c	2
	d	7
	e	8
(176)	a	4
	b	6
	c	7
	d	1
	e	3

Industrial Arts Examination Materials

PLASTICS

Directions (1-202): On your answer paper, write the number preceding the word or expression that, of those given, best completes the statement or answers the question.

Part I Plastic Products

Unit A Molding (1-18)

1 Which process is used to produce thin wall, hollow thermoplastics?

1 injection molding
2 vacuum forming
3 compression molding
4 blow molding

2 Most plastic squeezable bottles are produced by

1 blow molding
2 injection molding
3 rotomolding
4 compression molding

3 Injection molding is used mainly to mold

1 thermoset materials
2 elastomer materials
3 plastisol materials
4 thermoplastic materials

4 Which would be the most economical plastics processing method to use when making 50,000 quart containers per year?

1 extrusion
2 compression
3 injection
4 rotational

5 Which one of the following thermoplastic materials is injection molded?

1 polyethylene
2 epoxy
3 mezamine
4 phenolic

6 Which processing method would be used to mold a thermoset part with inserts such as an automobile distributor cap?

1 extrusion
2 injection
3 compression
4 transfer

7 Which processing method is generally used to mold thermosets?

1 thermoforming
2 rotational
3 compression
4 extrusion

8 Which process is not used to make disposable containers?

1 vacuum forming
2 blow molding
3 injection molding
4 rotomolding

9 The size designation of an injection molder is determined by the

1 size of the part
2 weight of the part
3 number of parts
4 thickness of the part

10 The amount of material used to fill a mold during an injection molding cycle is called the

1 charge
2 load
3 shot
4 capacity

11 What is the part on older injection molders which has been replaced by the reciprocating screw on newer injection molders?

1 sprue
2 hopper
3 barrel
4 ram

12 Which processing method will produce the largest number of plastic units per hour?

1 thermoforming
2 compression
3 vinyl dipping
4 injection

13 What is the main advantage of injection molding over other types of molding?

1 Production is higher.
2 The equipment costs less.
3 It costs less to make the molds.
4 Several colors of plastic can be molded at the same time.

14 Which form of plastic is generally used in the process of injection molding?

1 powder
2 liquid
3 sheet
4 pellet

15 Which type of plastic would most likely be used to mold an ash tray?

1 nylon
2 lexan
3 phenolic
4 styrene

16 The excess material left on a product after compression molding is the

1 overflow — 3 flash
2 runner — 4 charge

17 Compression molding pressures range from between

(1) 10 to 100 lb /in^2
(2) 100 to 1,000 lb /in^2
(3) 1,000 to 10,000 lb /in^2
(4) 10,000 to 100,000 lb /in^2

18 Which material is sprayed on a mold cavity to help keep the plastic from sticking to the mold?

1 part release — 3 parting agent
2 plasticizer — 4 mold release

Unit B Thermoforming (19-36)

19 Which one of the types of plastic listed below is most commonly used for thermoforming?

1 high-impact polystyrene — 3 polyester
2 polycarbonate — 4 rigid polyvinyl

20 The process of thermoforming works best when forming plastic

1 sheets — 3 pellets
2 powder — 4 beads

21 In which process is sheet plastic heated until soft and then forced around the contours of a mold?

1 fabricating — 3 compression molding
2 thermoforming — 4 injection molding

22 The bridging of plastics between multiple molds that are placed too close together during thermoforming is called

1 ribbing — 3 webbing
2 blanking — 4 blocking

23 In which type of thermoforming is the sheet drawn into a mold?

1 drape
2 mechanical
3 straight
4 snap-back

24 How many inches of vacuum should a thermoforming machine normally develop before forming?

(1) 12
(2) 17
(3) 22
(4) 28

25 When thermoforming, the size of the vacuum holes in a mold should be between

(1) .010 in -.025 in.
(2) .025 in -.035 in.
(3) .035 in -.045 in.
(4) .045 in -.055 in.

26 Which is the oldest plastics processing method?

(1) rotational
(2) thermoforming
(3) injection
(4) extrusion

27 The sides of a thermoforming mold are tapered to aid in the removal of the part. This taper is called the

(1) angle
(2) draft
(3) slope
(4) pitch

28 In straight thermoforming, what type of pressure does the actual forming?

1 mechanical
2 atmospheric
3 vacuum
4 compressed air

29 In straight vacuum thermoforming, what type of pressure does the actual forming?

1 vacuum
2 atmospheric
3 hydraulic
4 mechanical

30 A typical thermoformed product would be

1 a taillight lens
2 disposable silverware
3 trash containers
4 a briefcase

31 In the plastics industry, what is the thickness of plastic which separates the categories of sheet and film?

(1) .100
(2) .010
(3) .001
(4) 1.00

32 Compared to other processes, one of the major advantages of producing parts by thermoforming is

1 no secondary operations
2 low material cost
3 low mold cost
4 even wall thickness

33 Which method of thermoforming sheet plastic requires the greatest degree of accuracy?

1 vacuum forming
2 pressure forming
3 drape forming
4 matched mold forming

34 In thermoforming, the technique of forming a sheet of plastic over a male mold is called

1 draping
2 straightening
3 plug-assisting
4 snap-back

35 Before it can be bent or formed, acrylic plastic must be heated to a temperature between

(1) 100°F and 150°F
(2) 300°F and 350°F
(3) 500°F and 550°F
(4) 950°F and 1000°F

36 Which technique should be used to thermoform a part with an extremely deep draw?

1 straight vacuum
2 drape vacuum
3 matched die
4 pressure plug-assist

Unit C Fiber Reinforced Plastics (37-54)

37 The most common mold release used in fiberglass work is

1 polyvinyl alcohol
2 polyethylene
3 polystyrene
4 polyvinyl chloride

38 What agent is added by the polyester resin manufacturer to accelerate the cure of the resin in fiberglass work?

(1) MEK peroxide
(2) acetone
(3) styrene
(4) cobalt

39 Which thermosetting resin is usually used with glass reinforcing?

1 polyethylene
2 polystyrene
3 melamine
4 polyester

40 The resin most often used in the fiber reinforced molding process is

1 epoxy
2 polyester
3 silicone
4 phenolic

41 Cobalt is added to polyester resin for fiberglass by the manufacturer to

1 slow down the reaction
2 thin the resin
3 speed up the reaction
4 thicken the resin

42 A monomer that is used to thin polyester resin in fiberglass work is

1 chlorine
2 cobalt
3 styrene
4 fluorine

43 What percentage of catalyst is usually added to the laminating resin when saturating cloth or mat at room temperature?

(1) 1%
(2) 2%
(3) 3%
(4) 4%

44 Some polyester resins have a surfacing agent which rises to the surface to assist in curing the laminate. These resins are called

1 air-inhibited
2 non air-inhibited
3 thixotropic
4 nonthixotrophic

45 The simplest method used to produce reinforced, plastic-molded products is the

1 matched mold method
2 vacuum bag method
3 hand lay-up method
4 pressure mold method

46 Which molding process would be used to make a glass reinforced part with smooth surfaces on both sides and a very high glass content?

1 match die
2 contact
3 vacuum bag
4 flexible plunger

47 In fiberglass molding, a layer of resin is applied to both surfaces of the mold to prevent the glass from coming to the surface. This layer of resin is called a

1 resin coat
2 gel coat
3 soak coat
4 finish coat

48 Which glass reinforcing material is used in the manufacture of fishing rods?

1 mat
2 cloth
3 fibers
4 yarns

49 Which reinforcing material produces the strongest and thinnest plastic product?

1 chopped fibers
2 rovings
3 mat
4 cloth

50 Which material is most often used to reinforce molding?

1 asbestos mats
2 cloth fabrics
3 glass fibers
4 plastic fabrics

51 The strength of reinforced plastic can be increased by increasing the amount of

1 glass fibers
2 resin
3 hardener
4 colorant

52 What is the common name given to reinforced plastics?

1 fiberglass
2 spun glass
3 Plexiglas
4 hard glass

53 The high production matched molds used in reinforced plastic molding are usually made of

1 aluminum
2 steel
3 brass
4 copper

54 At what angle to the weave does fiberglass cloth flex most easily?

(1) 25°
(2) 35°
(3) 45°
(4) 55°

Unit D Extrusion (55-63)

55 Which process is used to make the monofilaments used in the weaving of cloth?

1 injection
2 drawing
3 compression
4 extrusion

56 Which one of the following plastic products is most easily made by the process of extrusion?

1 camera parts
2 trays
3 rods
4 taillight lenses

57 What extrusion technique is used to make plastic milk bottles at a very high production rate?

1 injection
2 coating
3 blow
4 calendering

58 In what process is hot, soft plastic forced through machine dies to form continuous shapes?

1 extrusion
2 injection
3 rotation
4 compression

59 In an extrusion machine, the plastic is pushed out through the die by

1 air pressure
2 a plunger
3 a ram
4 a screw

60 The extrusion process is used to put protective coatings on

1 wire
2 pliers
3 bottle caps
4 drying racks

61 What process is used to put plastic protective coatings on cables and wires?

1 injection
2 extrusion
3 rotomolding
4 compression

62 What process converts thermoplastics from a granular material to continuous lengths of finished products such as rods or pipes?

1 injection molding
2 extrusion
3 calendering
4 rotomolding

63 Which form of plastic is used in the extrusion process?

1 flakes
2 beads
3 granules
4 sheet

Unit E Foams (64-72)

64 Which type of pressure is used to expand polystyrene beads?

1 mechanical
2 atmospheric
3 steam
4 hydraulic

65 What gas is trapped in each polystyrene expandable bead that causes the bead to expand?

1 methane
2 oxygen
3 freon
4 pentane

66 The expansion of polystyrene beads into foam is a type of

1 chemical process
2 mechanical process
3 physical process
4 synthetic process

67 Compared to their original size, approximately how many times will polystyrene expandable beads expand?

(1) 10-20
(2) 30-40
(3) 50-60
(4) 70-80

68 Which determines the density of a finished polystyrene, expandable bead part?

1 the amount of colorant
2 the amount of catalyst
3 the amount of water
4 the amount of pre-expansion

69 Polystyrene expandable bead foams are used to make

1 pillows
2 sponges
3 car seats
4 insulation

70 Which type of foam would be used to line the inside of a football helmet?

1 polystyrene expandable beads
2 rigid polyurethane
3 flexible polyurethane
4 polyvinyl dispersions

71 The density of plastic foam is measued in

(1) lb /cu ft
(2) lb /sq ft
(3) lb /lin ft
(4) lb /board ft

72 If a foam product is buoyant, what type of cell structure must it have?

1 open cell
2 closed cell
3 interconnecting cells
4 irregular cells

Unit F Rotational Molding (73-81)

73 Rotomolding requires motion in how many directions at one time?

1 one
2 two
3 three
4 four

74 In order to obtain an even wall thickness in rotational molding, in how many planes should the mold be rotated?

1 one
2 two
3 three
4 four

75 Which forms of plastic are used for rotomolding?

1 liquids and powders
2 sheets and films
3 powders and pellets
4 liquids and resins

76 The material used in rotational molding or casting must be a material that acts like a

1 powder
2 vapor
3 solid
4 liquid

77 Which one of the following molding processes produces products that are most similar to those produced by rotational molding?

1 blow
2 extrusion
3 thermoforming
4 compression

78 An advantage of rotational molding over other types of molding is that it has a

1 shorter cycle time
2 lower mold cost
3 lower operating temperature
4 higher production

79 One disadvantage of rotomolding is the

1 long cycle period
2 cost of materials
3 cost of the mold
4 high temperatures required

80 Compared to other methods of molding, the biggest disadvantage of rotational molding is the

1 limited product size
2 low production
3 high equipment cost
4 thin wall sections

81 If a rotationally molded part is rough on the inside, what adjustment should be made?

1 add more material to the mold
2 increase the temperature
3 increase the RPM
4 decrease the RPM

Unit G Encapsulation (82-90)

82 Which process is used to encase electrical components in plastic?

1 laminating	3 casting
2 embedding	4 potting

83 Which process is used to preserve an insect in plastic for display?

1 potting	3 laminating
2 embedding	4 casting

84 Which plastic resin is used for encapsulating or embedding scientific specimens?

1 polyurethane	3 polyester
2 silicone	4 plastisol

85 In which process is a liquid plastic resin poured into an open mold and allowed to cure?

1 pouring	3 forming
2 casting	4 shaping

86 A casting cracks while embedding a coin in plastic. This was most likely caused by

1 too much catalyst	3 too much polyester
2 too little catalyst	4 too little polyester

87 Which form of plastic is needed for plastic casting?

1 liquid	3 pellets
2 film	4 beads

88 Which catalyst or initiator is used to cure a polyester resin?

1 ethylene dichloride	3 methyl ethyl ketone
2 methyl dichloride	4 hydrogen peroxide

89 Which type of heat is used to cure non air-inhibited polyester resins?

1 residual	3 exothermic
2 thermo	4 endothermic

90 Why is a catalyst added to liquid casting resins?

1 to add color
2 to speed the hardening
3 to prevent cracking
4 to prevent bubbles

Unit H Industry and Careers (91-98)

91 In the plastics industry, a mold builder is classified as

1 professional
2 skilled
3 technical
4 semiskilled

92 In the plastics industry, persons who operate semiautomatic or automatic molding machines are classified as

1 professional
2 skilled
3 technical
4 semiskilled

93 In the plastics industry, the job of testing and quality control is classified as

1 professional
2 skilled
3 technical
4 supervisory

94 Which department is responsible for inspecting molded plastic products to see that standards are maintained?

1 production
2 quality control
3 product control
4 engineering

95 Which person is responsible for preparing a molding machine for production by installing the molds and making the appropriate adjustments?

1 set up man
2 technician
3 foreman
4 machine operator

96 Which person performs tests on raw materials and finished plastic products?

1 a research chemist
2 a quality control inspector
3 a laboratory analyst
4 a chemical engineer

97 An operator that mixes resin color and lubricants for processing equipment is called a

1 general laborer
2 banbury operator
3 mixer operator
4 blender operator

98 Which person would prepare the finished drawings of plastic products, tools, machine parts, and molds?

1 production assistant
2 engineer
3 engineering technician
4 set up man

Unit I Industrial Organizations (99-107)

99 Companies that produce plastic sheets, rods, and tubes by forcing the plastic through a die are called

1 molders
2 fabricators
3 laminators
4 extruders

100 Companies which produce the basic plastic resins or compounds are called

1 thermoformers
2 material manufacturers
3 fabricators
4 extruders

101 Which group of people are members of the plastics industry?

1 material manufacturers and molders
2 molders and heat treaters
3 fabricators and metallurgists
4 material manufacturers and heat treaters

102 Companies that fashion and decorate plastic products are classified as

1 molders and extruders
2 material manufacturers
3 fabricators and finishers
4 formers and testers

103 Companies that vacuum-form sheet materials such as airplane canopies are classified as

1 molders
2 finishers
3 fabricators
4 coaters

104 Companies that produce plastic sheets, rods, and tubes from paper and cloth impregnated with resin by using heat and pressure are called

1 extruders
2 molders
3 fabricators
4 laminators

105 Companies that use plastic resins to form a finished product through a forming device are called

1 laminators
2 molders
3 coaters
4 finishers

106 Companies that transform plastic resins into finished products are called

1 chemical companies
2 molders
3 fabricators
4 finishers

107 What is the name of the organization that has set up standardized tests for testing the different properties of plastics?

1 American Society for Testing and Materials
2 Society of the Plastics Industry
3 National Society for Testing Plastics
4 American Laboratory for Testing Plastics

Part II

Plastics Processes

Unit A Polymer Chemistry (108-131)

108 Into how many basic types are plastics divided?

(1) 6
(2) 2
(3) 8
(4) 4

109 What is the basic molecular building unit which is used to make plastics?

1 copolymer
2 polymer
3 subpolymer
4 monomer

110 A cross-linked, chainlike, molecular structure is characteristic of

1 nylon
2 phenolic
3 polyethylene
4 vinyl

111 The basic building blocks used by chemists to make plastics are

1 atoms
2 molecules
3 compounds
4 electrons

112 A plastic which can be reprocessed because it will soften again is called

1 a thermoset
2 a thermoplastic
3 a polyplastic
4 an elastomer

113 A plastic which can not be reprocessed because it will not soften again is called

1 an elastomer
2 a thermoset
3 a polyplastic
4 a thermoplastic

114 Which one of the following is a thermosetting plastic?

1 acrylic
2 polystyrene
3 vinyl
4 epoxy

115 The leading thermoset plastic used for making dinnerware is

1 acrylic
2 melamine
3 nylon
4 vinyl

116 Which type of plastic can be remelted?

1 epoxy
2 nylon
3 phenolic
4 melamine

117 What type of plastic is made up of two different monomer units?

1 copolymer
2 polymer
3 alloy
4 tripolymer

118 The intermediate stage in the reaction of a thermosetting resin in which the material softens when heated but does not entirely fuse or dissolve is called the

(1) A - stage
(2) B - stage
(3) C - stage
(4) D - stage

119 The final stage in the reaction of a thermosetting resin in which the material is fully cured, insoluble, and infusible is called the

(1) A - stage
(2) B - stage
(3) C - stage
(4) D - stage

120 The plastic most commonly used for dinnerware is

1 acrylic
2 melamine
3 nylon
4 vinyl

121 The common name for polyamide is

1 nylon	3 styrene
2 vinyl	4 acrylic

122 Which plastic undergoes a physical and a chemical change when heat is applied?

1 phenolic	3 polyethylene
2 vinyl	4 nylon

123 Which chemical element is considered the backbone of a polymer?

1 carbon	3 oxygen
2 chlorine	4 fluorine

124 A cloudy plastic such as linear polyethlene would have a type of structure known as

1 amorphous	3 isotactic
2 crystalline	4 atactic

125 The impact strength of plastics is actually a measure of the plastic's

1 stiffness	3 tensile strength
2 toughness	4 permeability

126 A synthetic material formed through the process of polymerization is called

1 an element	3 resin
2 a solution	4 a molecule

127 The first plastic developed as a replacement material for ivory was called

1 cellulose nitrate	3 styrene
2 polyethylene	4 nylon

128 In what year did Dr. Leo Baekeland develop the first thermoset plastic?

(1) 1868	(3) 1909
(2) 1900	(4) 1927

129 Who developed the first plastic in 1868?

1 Leo Baekeland	3 John Hyatt
2 John Peterson	4 William Boyd

130 The most common test used to identify polymers (plastics) is the

1 hardness test	3 impact test
2 permeability test	4 burning test

131 Most of the raw materials used in making plastics come from the

1 petroleum industry	3 lumbering industry
2 mining industry	4 farming industry

Unit B Molds (132-152)

132 Industrial molds for injection molding are made of

1 brass	3 copper
2 tool steel	4 aluminum

133 In injection molding, the opening through which the plastic enters the cavity is called the

1 nozzle	3 runner
2 sprue	4 gate

134 Which part of an injection mold removes the molded part from the cavity?

1 guide pins	3 sprue puller
2 sprue bushing	4 ejection pins

135 In injection molding, the object is formed in the

1 cavity
2 runner
3 gate
4 sprue

136 In injection molding, the plastic enters the mold cavity through a restriction called the

1 sprue
2 runner
3 gate
4 channel

137 The mark on a molding where the halves of the mold meet in closing is called the

1 dividing line
2 parting line
3 separating line
4 molding line

138 What type of compression mold can be made most easily?

1 positive mold
2 landed mold
3 flash mold
4 matched mold

139 Compression molds are usually made of

1 aluminum
2 steel
3 iron
4 copper

140 In rotational molding, the molds are made of

1 tool steel
2 lead
3 zinc
4 cast aluminum

141 Which type of mold is designed to permit the excess molding material to escape during closing?

1 double mold
2 positive mold
3 flash mold
4 flexible mold

142 Which mold-making material would make the most durable mold for injection molding?

1 gypsum cement
2 epoxy
3 metal
4 elastomeric

143 Which material would be used to make the least expensive mold for prototype development?

1 gypsum cement
2 metal
3 epoxy
4 elastomeric

144 All plasters used to make molds are manufactured from a natural mineral called

1 gypsum
2 talc
3 sand
4 quartz

145 Which mold-making material would be used to mold a product with undercuts?

1 epoxy
2 gypsum cement
3 metal
4 elastomeric

146 Most extrusion dies are made of

1 aluminum
2 brass
3 steel
4 copper

147 Which pair of mold materials is best suited for making experimental injection molds?

1 low-melting metals and epoxy
2 epoxy and steel
3 plaster and steel
4 steel and low-melting metals

148 A mold that is designed to permit excess molding material to escape during closing is called a

1 double mold
2 positive mold
3 flash mold
4 flexible mold

149 A compression mold designed to contain all the molding material when it closes is called a

1 single mold
2 flash mold
3 positive mold
4 solid mold

150 Most blow molds are made of

1 brass
2 copper
3 aluminum
4 steel

151 The main material used to make molds for the blow molding process is

1 tool steel
2 copper
3 brass
4 machined aluminum

152 The type of plaster used to make large models and molds would be classified as

1 super-hard
2 general-purpose
3 low-expansion
4 high-expansion

Unit C Laminates (153-161)

153 When calculating the load pounds needed to laminate a magazine article, the proper p.s.i. is multiplied by the

1 plate size
2 thickness of the article
3 area of the plastic
4 thickness of the plastic

154 A laminating press requires 350 pounds per square inch What is the total pressure needed to laminate a 2 inch × 5 inch card?

(1) 35 pounds
(2) 350 pounds
(3) 3,500 pounds
(4) 35,000 pounds

155 At what pressure is high-pressure laminating done?

(1) under 100 p.s.i
(2) 100-400 p s.i.
(3) 500-900 p.s i
(4) 1,000 & over p.s.i.

156 What should be the minimum overlap of plastic around a trimmed, laminated newspaper clipping?

(1) 3 mm. (1/8 in.)
(2) 6 mm (1/4 in.)
(3) 10 mm. (3/8 in.)
(4) 12 mm. (1/2 in)

157 What are the three low pressure, laminating variables which must be controlled to obtain satisfactory results?

1 cycle, time, pressure
2 pressure, temperature, time
3 temperature, time, cycle
4 temperature, pressure, cycle

158 Which two materials are used for high-pressure laminating?

1 phenolic and melamine
2 epoxy and polyethylene
3 polystyrene and vinyl
4 polyester and styrene

159 Which form of plastic is used in the low-pressure laminating process?

1 sheets
2 powder
3 resins
4 pellets

160 Which two plastic materials are used for low-pressure laminating?

1 epoxy and melamine
2 polyethylene and styrene
3 acrylic and polyester
4 vinyl and acetate

161 In which process are two or more layers of materials bonded together?

1 molding	3 fabricating
2 forming	4 laminating

Unit D Flexible Foams (162-172)

162 Which group of plastics provides good cushioning properties and is a good sound and energy absorber?

1 expandable beads	3 vinyl plastisol
2 flexible foams	4 polyester resin

163 One advantage of plastic foam over foam rubber is that plastic foam will not

1 deteriorate	3 sink
2 burn	4 shrink

164 In which two forms are flexible foams produced?

1 slab stock and molded
2 film and pellets
3 sheet and beads
4 liquid and powder

165 Two flexible foams that are most commonly used in the cushioning industry are

1 polypropylene and polystyrene
2 plastisol and polyester
3 polyethylene and polyurethane
4 polyvinyl and phenolic

166 Flexible foams are mainly used for

1 fabricating	3 cushioning
2 decorating	4 forming

167 Two major production techniques used with flexible foams are

1 fabricating and laminating
2 thermoforming and extruding
3 casting and coating
4 slab and molding

168 Which physical property of flexible foam is most difficult to measure?

1 weight
2 moisture content
3 chemical resistance
4 impact strength

169 Flexible foams are normally cut with

1 a circular saw or a knife
2 a hacksaw or a razor blade
3 an electric knife or a razor blade
4 tin snips or scissors

170 Which process is used to foam polyurethane?

1 chemical foaming
2 heat foaming
3 physical foaming
4 pressure foaming

171 In which process is a plastic expanded and fused by physical or chemical means?

1 welding
2 forming
3 foaming
4 thermoforming

172 Which type of resin is most often used for the foaming-in-place process?

1 polyvinyl
2 polyethylene
3 polystyrene
4 polyurethane

Unit E Coatings (173-182)

173 What are the two operating variables to be considered when a hot dip coating of plastic is applied to an object?

1 RPM and time
2 time and pressure
3 temperature and time
4 temperature and pressure

174 The vinyl suspension used in the plastic coating process is called

1 plastisol
2 acrylic
3 polyester
4 polystyrene

175 What range of temperatures is usually used to cure plastisols?

(1) 50° F - 150° F
(2) 200° F - 250° F
(3) 300° F - 450° F
(4) 600° F - 650° F

176 The ideal wall thickness for a vinyl dipped coin purse is

(1) 25 mm. (1 in)
(2) 13 mm. (1/2 in)
(3) 3 mm. (1/8 in)
(4) 6 mm. (1/4 in)

177 If an object is to be powder coated by the fluidized bed method it must first be

1 chemically treated
2 sand blasted
3 soaked
4 preheated

178 What is the main advantage of a fluidized bed coating over a vinyl dipping?

1 It provides a thicker coating.
2 It can be done faster and cleaner.
3 It can be done at a lower temperature
4 No preheating is necessary.

179 Which process is used to produce products such as automotive upholstery, shower curtains, rain wear, and floor coverings?

1 calendering
2 extrusion
3 rotomolding
4 injection

180 Which process would put a thin uniform coating of plastic on a pair of plier handles in the shortest period of time?

1 hot dipping
2 vinyl dipping
3 cold dipping
4 fluidizing

181 Which process would be used to protect a tool from rusting and to protect its cutting edge during shipment and storage?

1 hot dipping
2 fluidizing
3 vinyl dipping
4 cold dipping

182 Plastisols and organisols belong to a family of plastics called

1 vinyl dispersions
2 polyofins
3 fluorocarbons
4 acrylics

Unit F Bonding (183-191)

183 Cementing plastics together with a solvent is most similar to

1 stapling paper together
2 nailing wood together
3 riveting steel together
4 welding metals together

184 Which solvent is used to weld two pieces of acrylic together?

1 methylene chloride
2 acetone
3 methyl ethyl ketone
4 ethyl benzene

185 Which solvent is used for acrylic sheet plastic?

1 turpentine
2 plastisol
3 polyester resin
4 methylene chloride

186 Which welding method should be used to fabricate plastic tanks?

1 fusion
2 spin
3 hot gas
4 ultrasonic

187 In hot gas welding, the gas pressures should range between

(1) 5 to 15 p.s.i.
(2) 15 to 25 p.s.i.
(3) 25 to 35 p.s.i.
(4) 35 to 45 p.s.i.

188 What is the most common plastic used for hot gas welding?

1 polystyrene
2 polyvinyl chloride
3 polycarbonate
4 cellulose acetate

189 Using a solvent cement to weld or fuse plastic pieces together is called

1 cohesion
2 adhesion
3 mechanical fastening
4 brazing

190 What type of bonding causes an intermingling of molecules from each piece of plastic?

1 adhesion
2 cohesion
3 polar attraction
4 molecular attraction

191 Which plastic can not be easily assembled by ultrasonic welding?

1 acrylic
2 polystyrene
3 polyethylene
4 polycarbonate

Unit G Packaging (192-202)

192 Which method of processing is used to make plastic film for packaging?

1 laminating
2 casting
3 thermoforming
4 extrusion

193 The major uses of heat sealing plastics are in the areas of

1 thermoforming and decorating
2 packaging and textiles
3 fabricating and forming
4 extruding and rotomolding

194 Packaging temperatures range in degrees from

(1) 50° F to 200° F
(2) 250° F to 400° F
(3) 450° F to 600° F
(4) 650° F to 800° F

195 The simplest method of sealing packages wrapped in plastic is by

1 thermal heat sealing
2 impulse heat sealing
3 ultrasonic sealing
4 dielectric sealing

196 Most packages wrapped in plastic are sealed by

1 glue
2 heat
3 adhesion
4 chemical welding

197 Two variables that must be controlled when hand packaging on a bar sealer are

1 temperature and charge
2 time and temperature
3 pressure and time
4 temperature and RPM

198 Which sealing process uses a timer to control the heating cycle so that the seal can be cooled under pressure?

1 fusion
2 impulse
3 friction
4 ultrasonic

199 When a shrink film is used for packaging, in how many directions will it shrink when heat is applied?

(1) 1
(2) 2
(3) 3
(4) 4

200 Of the plastic films listed below, which one would be the least expensive for packaging?

1 vinyl
2 teflon
3 polyethylene
4 mylar

201 In which process is a heated tool used to weld plastic together?

1 fusion welding
2 friction welding
3 hot gas welding
4 ultrasonic welding

202 The skin and blister packaging technique is based on the principle of

1 pressure forming
2 vacuum forming
3 heat forming
4 hydraulic forming

Group Questions (203-219)

203 On the line at the left of each molded plastic part listed in parts a through e, write the number of the molding process, chosen from the list below, that would be used to mold that part. [5]

Molding Processes

(1) Injection
(2) Compression
(3) Thermoforming
(4) Extrusion
(5) Rotational
(6) Encapsulation
(7) Transfer

____ a Cooking utensil handles
____ b Outdoor advertising signs
____ c 300-gallon containers
____ d Taillight lenses
____ e Rods and tubes

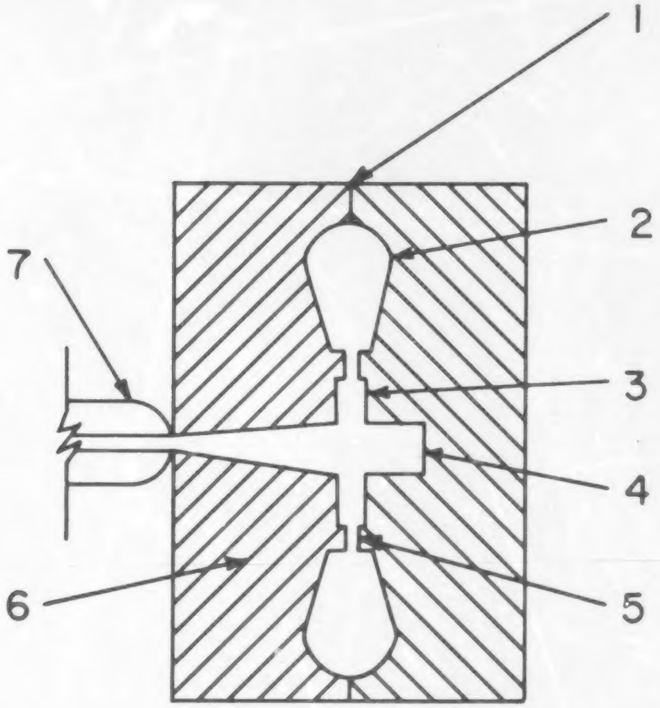
204 On the line at the left of each type of plastic process listed in parts a through e, write the number of the plastic form, chosen from the list below, that would be used in that process. [5]

Plastic Form

(1) Liquid
(2) Sheets
(3) Gas
(4) Film
(5) Powder
(6) Flakes
(7) Pellets

____ a Laminating (low-pressure)
____ b Injection molding
____ c Fabricating
____ d Compression molding
____ e Casting

205 A diagram of an injection mold is shown below. On the line at the left of the mold part listed in *a* through *e*, write the number that indicates that part on the diagram. [5]

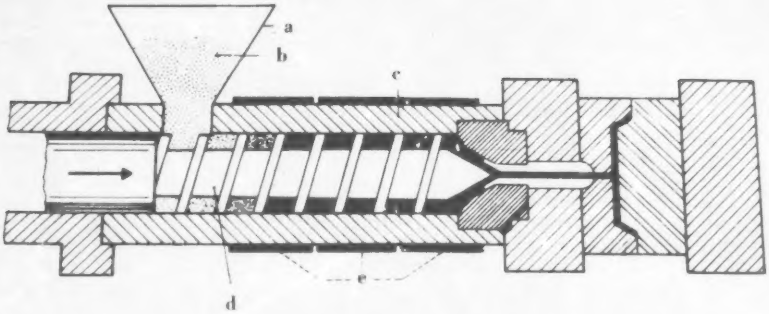


____ *a* Runner
____ *b* Cavity
____ *c* Sprue
____ *d* Parting line
____ *e* Gate

206 On the line at the left of parts a through e, write the number of the screw injection molder part, chosen from the list below, that is indicated by that letter in the diagram. [5]

Injection Molder Parts

(1) Mold
(2) Heaters
(3) Screw
(4) Nozzle
(5) Resin
(6) Ram
(7) Hopper
(8) Cylinder



____ a
____ b
____ c
____ d
____ e

207 On the line at the left of each injection molding defect listed in parts a through e, write the number of the remedy, chosen from the list below, that would correct that defect. [5]

Remedies

(1) Increase the temperature
(2) Purge the cylinder
(3) Cool in the mold longer
(4) Dry the resin
(5) Decrease the temperature
(6) Apply a mold release spray
(7) Increase the injection time

____ a Flash around the part
____ b A warped part
____ c Excessive shrinkage
____ d A short shot
____ e Black specks in the part

208 On the line at the left of each plastic process listed in parts a through e, write the number of the shaping device, chosen from the list below, that is used in that process. [5]

Shaping Devices

(1) Die opening
(2) Hollow split mold
(3) Matched mold
(4) Open mold
(5) Flat platens
(6) Pairs of rollers
(7) Solid mold

____ a Laminating
____ b Injection molding
____ c Extrusion
____ d Blow molding
____ e Calendering

209 On the line at the left of each thermoforming description in parts a through e, write the number of the forming method, chosen from the list below, to which that description applies. [5]

Thermoforming Methods

(1) Matched mold forming
(2) Open forming
(3) Pressure forming
(4) Blister and skin forming
(5) Cast forming
(6) Vacuum forming
(7) Drape forming

____ a Most exact thermoforming method
____ b Most versatile thermoforming method
____ c Uses compressed air for thermoforming
____ d Easiest method of thermoforming
____ e Used for packaging

210 On the line at the left of each fiberglassing situation listed in parts a through e, write the number of the glass reinforcing material, chosen from the list below, that would be used in that situation. [5]

Glass Reinforcing Materials

(1) Chopped strands
(2) Cloth
(3) Roving
(4) Mat
(5) Surfacing mat
(6) Milled fibers

____ a Used where the most strength and least thickness are needed
____ b Used for rapid buildup and drapability
____ c Used with a fiberglass chopper
____ d Used as a reinforcing material in molding compounds
____ e Used to produce a very smooth, thin surface

211 On the line at the left of each plastic reinforcing process listed in parts a through e, write the number of the characteristic, chosen from the list below, that best describes that process. [5]

Characteristics

(1) Used for high production
(2) Makes use of atmospheric pressure
(3) Uses split hollow mold
(4) Simplest and oldest process
(5) Uses a flexible mold
(6) Uses an inflated bag
(7) Resin is applied with pressure gun

____ a Hand layup
____ b Spray layup
____ c Matched mold
____ d Pressure bag process
____ e Vacuum bag process

212 On the line at the left of each rotational molding defect listed in parts a through e, write the number of the remedy, chosen from the list below, that would correct that defect. [5]

Remedies

(1) Increase the coating time
(2) Decrease the temperature
(3) Increase the cycle time
(4) Clean the mold lips
(5) Vent the mold
(6) Increase the rotation speed
(7) Add more material

____ a Rough inside surface
____ b Excess flash around the part
____ c Wall thickness too thin
____ d Warped part
____ e Part collapses in the mold

213 On the line at the left of each plastic product listed in parts a through e, write the number of the plastic resin, chosen from the list below, that would be used to make that product. [5]

Plastic Resin

(1) Acrylic
(2) Phenolic
(3) Polyethylene
(4) Polyvinyl chloride
(5) Polyester
(6) Polyurethane
(7) Nylon

____ a Raincoat
____ b Seat cushions
____ c Gears
____ d Taillight lenses
____ e Squeezable bottles

214 On the line at the left of each plastic trade name listed in parts a through e, write the number of the plastic family, chosen from the list below, to which that trade name belongs. [5]

Plastic Families

(1) Polyester fiber
(2) Styrene
(3) Acrylic
(4) Polycarbonate
(5) Vinyl chloride
(6) Expanded polystyrene
(7) Fluorocarbon

____ a Plexiglas
____ b Lexan
____ c Dacron
____ d Styrofoam
____ e Teflon

215 On the line at the left of each physical property listed in parts a through e, write the number of the definition, chosen from the list below, which best defines that physical property. [5]

Definitions

(1) Ability to conduct electricity
(2) Property to resist a crushing force
(3) The ease with which a liquid flows
(4) Ability to allow light to pass through it
(5) Ability to resist pulling force
(6) Property of resisting transmission of vibration
(7) Ability to resist sharp blows or shocks

____ a Viscosity
____ b Tensile strength
____ c Compressive strength
____ d Impact strength
____ e Damping

216 On the line at the left of each definition in parts a through e, write the number of the term, chosen from the list below, that is defined by that definition. [5]

Terms

(1) Atactic
(2) Polymerization
(3) Amorphous
(4) Monomer
(5) Crystallinity
(6) Thermoplastic
(7) Isostatic

____ a Molecular chains are far apart with spaces between
____ b The basic building unit used to make a plastic
____ c Molecular chains are packed tightly together
____ d The process of making a plastic
____ e A plastic that can be reprocessed

217 On the line at the left of each plastic ingredient listed in parts a through e, write the number of the phrase, chosen from the list below, that best describes how the ingredient would effect the plastic to which it is added. [5]

Effect on Plastic

(1) Lowers the viscosity of plastic
(2) Adds color to plastic
(3) Prevents the degradation of plastic
(4) Makes plastic fluid
(5) Adds strength to plastic
(6) Makes plastic biodegradable
(7) Makes plastic clear

____ a Filler
____ b Solvent
____ c Plasticizer
____ d Stabilizer
____ e Colorant

218 On the line at the left of each object listed in parts a through e, write the number of the application method, chosen from the list below, that would be used to plastic coat that object. [5]

Method of Application

(1) Spray
(2) Cold dip
(3) Fluidized bed
(4) Rotomolding
(5) Hot dip
(6) Slush
(7) Roller

____ a Completely enclosed object
____ b Window sash
____ c Semi-hollow kicking tee
____ d Coin purse
____ e Inside walls of a tank car

219 On the line at the left of each phrase in parts a through e, write the number of the welding method, chosen from the list below, that is best described by that phrase. [5]

Welding Methods

(1) Friction
(2) Induction
(3) Fusion
(4) Solvent
(5) Hot gas
(6) Dielectric
(7) Ultrasonic

____ a Heated air is used to soften the plastic
____ b A heated tool is used to soften the plastic
____ c Mechanical vibrations are used to soften the plastic
____ d A liquid is used to soften the plastic
____ e Plastic parts are spun together at high speed

Industrial Arts Examination Materials
PLASTIC PRODUCTS

Scoring Key

Multiple-Choice Questions

(1) 4
(2) 1
(3) 4
(4) 3
(5) 1
(6) 4
(7) 3
(8) 3
(9) 2
(10) 3
(11) 4
(12) 4
(13) 1
(14) 4
(15) 3
(16) 3
(17) 3
(18) 4
(19) 1
(20) 1
(21) 2
(22) 3
(23) 3
(24) 4
(25) 1

(26) 2
(27) 2
(28) 2
(29) 2
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(32) 3
(33) 4
(34) 1
(35) 2
(36) 4
(37) 1
(38) 4
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(193) 2
(194) 2
(195) 1
(196) 2
(197) 2
(198) 2
(199) 2
(200) 3
(201) 1
(202) 2

Industrial Arts Examination Materials
PLASTIC PRODUCTS
Scoring Key
Group Questions

(203)	a	2
	b	3
	c	5
	d	1
	e	4
(204)	a	4
	b	7
	c	2
	d	5
	e	1
(205)	a	3
	b	2
	c	4
	d	1
	e	5
(206)	a	7
	b	5
	c	8
	d	3
	e	2
(207)	a	5
	b	3
	c	7
	d	1
	e	2
(208)	a	5
	b	3
	c	1
	d	2
	e	6
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	b	6
	c	3
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	e	4
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	b	4
	c	3
	d	6
	e	5
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	b	7
	c	1
	d	6
	e	2
(212)	a	3
	b	4
	c	7
	d	1
	e	5
(213)	a	4
	b	6
	c	7
	d	1
	e	3
(214)	a	3
	b	4
	c	1
	d	6
	e	7

(215) a 3
b 5
c 2
d 7
e 6

(216) a 3
b 4
c 5
d 2
e 6

(217) a 6
b 4
c 1
d 3
e 2

(218) a 4
b 3
c 6
d 5
e 1

(219) a 5
b 3
c 7
d 4
e 1